

*A national look at a local challenge*

# Kansas Community Featured in National Press Prompts New Conversation About Groundwater Challenges . . . Across the State



**A** recent story in a national publication has turned new attention to groundwater quality in Kansas.

In “Drinking Problems: A Kansas town confronts a tap-water crisis” in the May 2018 issue of *Harper’s Magazine*, journalist Elizabeth Royte tells the story of Pretty Prairie, Kansas, and its history of high nitrates in its drinking water.

The Reno County community is in the process of building a treatment plant with an estimated cost of about \$3 million to lower the nitrate level in the city’s drinking water, which has exceeded the U.S. Environmental Protection Agency’s Maximum Contaminant Level for nitrates for decades.

The city has, over the years, tried a number of solutions to provide low-nitrate water to at-risk populations, such as pregnant and nursing mothers and infants. The EPA considers these people most likely to develop health issues related to nitrates, such as methemoglobinemia, or “blue baby syndrome,” where babies aren’t able to get enough oxygen in their blood to function properly.

When nitrate levels in Pretty Prairie rose instead of falling, the EPA and the Kansas Department of Health and Environment issued orders requiring Pretty Prairie to find a more permanent solution to their nitrate challenge – the multi-million dollar treatment plant.

Commercial fertilizers used in agriculture and horticulture – rural and urban – are common causes of high nitrates in groundwater.

After visiting Pretty Prairie and learning about the town’s agricultural heritage Royte posed a question in the article: why hasn’t the city penalized nearby farmers using the same chemicals causing their water contamination?

It’s more complicated than that, said Ned Marks of Terrane Resources, a Stafford-based consulting company.

Marks, a geologist, described Pretty Prairie as a unique situation, one akin to “being dealt a bad hand of cards.”

The city had been in compliance with the EPA’s MCL for nitrates, Marks said, when the MCL was 20 parts per million. When the EPA lowered its MCL for nitrates to 10 parts per million, he said, the city immediately fell out of compliance.

Marks has had success in other communities in Kansas who have also been out of compliance for nitrate contamination by drilling deeper wells farther into aquifers, avoiding nitrates that have seeped through into the upper portions of the groundwater underneath those communities.

Pretty Prairie, however, has some nitrates at the top of the aquifer and excessive nitrates at the bottom of the aquifer.

“There’s just no explanation for it, unless it’s from old, old fertilizer applications,” Marks said.

With poor quality water at all levels of the aquifer, he said, it would take quite a bit of time to mitigate the contamination, as the contaminated groundwater moved away from the city’s well field. The groundwater moves at a rate of about 18 inches per day in that part of the aquifer.

There are situations that require a full-size water treatment plant, Marks said. But communities can often avoid such measures.

Englewood, a city of about 80 people in Clark County, is a lesson in those efforts, Marks said, from choosing an appropriate site to taking steps to protect the wellheads and the source water.

Several years ago, the city faced significant challenges in both water quality and quantity. The amount they had been pumping exceeded the amount allowed by their water right; the water they distributed was found to be above the allowable limit of arsenic.

City staff and consultants began looking for alternate sources of better quality water. On a recent sunny day, Marks and a crew from Nash Water Well Service worked in the Englewood Cemetery just north of town on the most recent phase of the project.

The site is on the very southeast toe of the Ogallala Aquifer, Marks said – go another mile to the south, and it’s gone. But, he said, unlike the alluvial aquifer from the Cimarron River and the local Five Mile Creek, where the city had been pumping its water, there isn’t a problem with arsenic in the new location.

Also, there seems to be more water available than the old site.

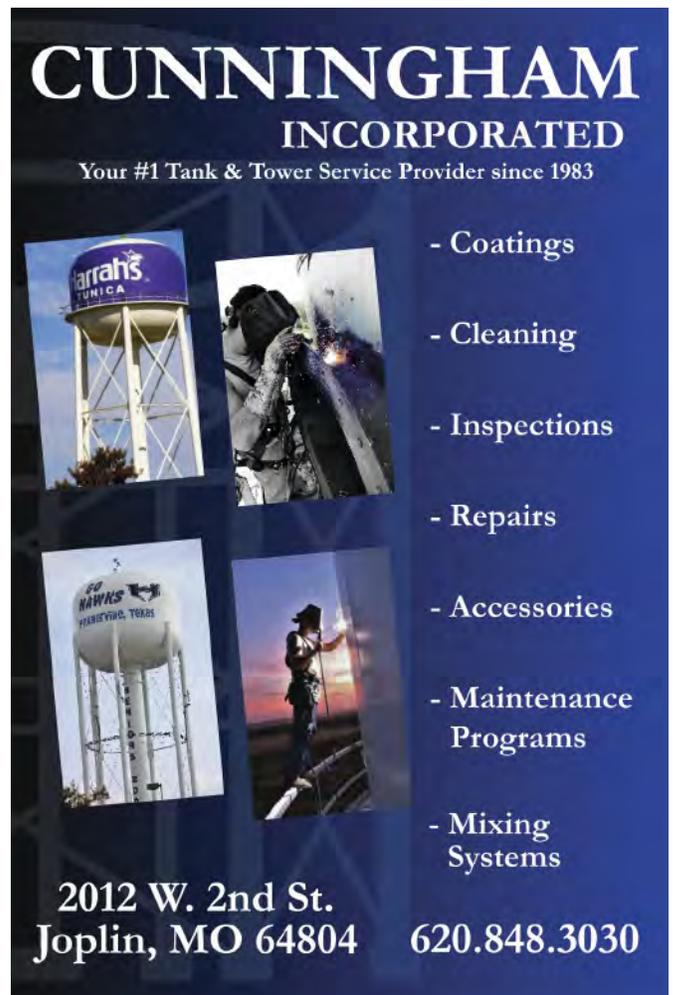
“If we can get 80 gallons per minute, that should be sufficient,” said Olen Whisenhunt, the town’s mayor. “I would like to have a 1,000 gallon per minute well, but that’s hard to find out here.”

Whisenhunt is in his second term as mayor. “You don’t run for election around here, you get drafted,” he said – and his tenure has been full of challenges. In 2017, the Englewood area was hit hard by the wildfires that consumed hundreds of thousands of acres of land along the Kansas/Oklahoma border.

They are making progress now on their water challenges with the project at the cemetery, one that has drawn the attention of the Division of Water Resources at the Kansas Department of Agriculture, the Kansas Department of Health and Environment, and the U.S. Environmental Protection Agency.

On a sunny day in late May, the crew cleaned out an old test well to help determine if it could become a supply well for the city. They brought chlorinated water from a nearby source to use in the drilling process.

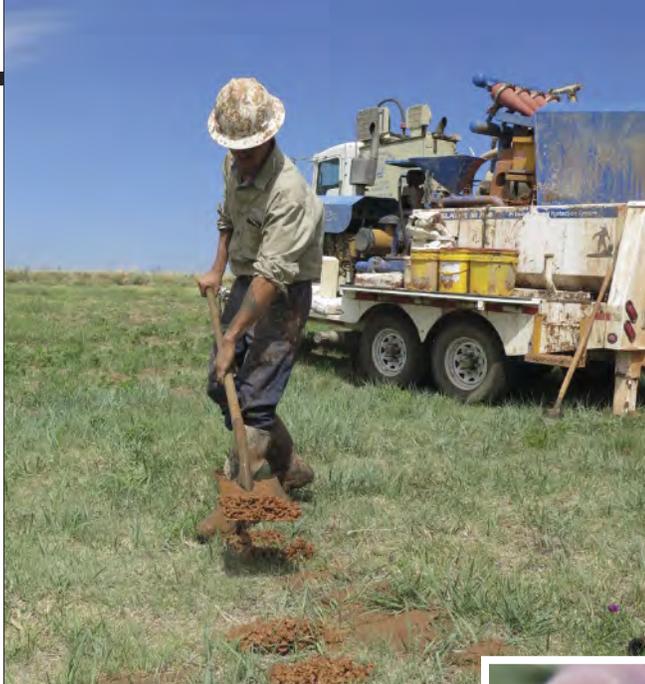
“The last thing we want to do is use bacteria-laden water,” Marks said, “or use arsenic-contaminated water when we’re trying to fix an arsenic problem.”



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**Jason Bone of Nash Water Well Service, Dodge City, Kansas sets out samples pulled from a new test well at Englewood, Kansas.**

**Geologist Ned Marks, Terrane Resources, Stafford, Kansas displays a piece of clay from the test well drill site. Marks tore apart the clay to assess the quality of the material and to see if there is any organic matter in the sample that could affect the well's design.**



The next step was to drill a new test well at the site to a similar depth of 129 feet, another difference from the town's old wells, which are much shallower. And, if that goes well, a third well at the same site would be drilled.

The three wells, plus the two miles of pipe to carry the water into town, is a far less expensive proposition than a large treatment plant, Marks and Whisenhunt said. The project is estimated to cost around \$750,000. A larger treatment plant could cost upwards of \$2 million, plus ongoing operating and maintenance costs.

The city's 60 water customers now pay about \$40 for the first 4,000 gallons of water, Whisenhunt said; he expects that the city will tweak its rate structure to bring in more income to help pay for the project, but predicts that rate increases will be minimal.

### **"Location, location, location"**

The cemetery is down-gradient from sand hills and pasture land, Marks said, and nitrate levels are relatively low. The goal once the wells are drilled is to keep the nitrates from finding a path straight down to the water.

"The aquifer here is all recharge-driven," he said. "Any water in the aquifer that we would get from Colorado would be so little here. All we get here is from local precipitation."

That precipitation has not arrived this year, Whisenhunt said. Between October and early May, the area had received less than two inches of rain.

While there is a layer of clay protecting the aquifer, any fracture or fissure could provide a pathway for contaminants from the surface to enter the groundwater, Marks said.

"When it comes to a site for a well, it comes down to three words: location, location, location," he said. "It's just like real estate. You look for the best location, and then you design it. If you don't have a location that will really work, then it's all up to the design to prevent contamination."

Marks will test the samples produced from the drilling of the test well to determine the site's geology and, therefore, the design. He'll recommend running a perforated pipe – a screen – into the aquifer, fill the area around the screen with just the right amount of selected filter pack to maximize the flow of the clean water into the well, then backfill the

annular space, between the well casing and borehole, with approved grout or fill material to prevent contamination from the surface or shallow ground zones from entering the well bore.

Sampling is important, even if the water looks clear, to make sure the water is free of contaminants such as arsenic and bacteria.

"We're looking at both the geology and the biology," Marks said.

While he will send the samples to a laboratory for further testing, he pointed out visible characteristics in the sand, gravel and silt – including a sample

from about 71 feet deep with a thin layer of plant material running through the clay.

A good location is the best predictor of good quality water, but sometimes, Marks said, water systems must work with what they have.

Other sites near Englewood would have been more preferable, given their location, he said, but the city could not reach an agreement with the landowners of those sites. That led them to consider the site at the cemetery, which the city had leased from the township.

On the positive side, Marks said, there are few nitrates present in the environment at the new wellfield. Because the site is down-gradient from rangeland, any possible contamination from grazing cattle will stay in the environment – returning the organic matter they are consuming from the grassland back into the ecosystem.

"Most people don't understand that the nitrogen in the plant material is being harvested by the animals and converted into beef," he said. "They're not adding any additional nitrogen into the system."

### **The importance of source protection**

Englewood shares similarities with Pretty Prairie and other communities in Kansas dealing with drinking water contamination: they want to select the best possible site to produce the right amount of quality water, and, once that is accomplished, protect the source of that water.



**Geologist Ned Marks, Englewood Mayor Olen Whisenhunt and Trevor Nash, owner of Nash Water Well Service, monitor the flow and clarity of water being pumped from a test well at Englewood.**

The goal to protect the source water extends far and wide, even in urban and suburban areas, Marks said. A new housing development where all of the homes are on septic systems would not be a good candidate if in close proximity or up-gradient from a water system's wellfield.

It's important to get the site requirements right, he said. "The cost of fixing that is horrendous," he said.

Professionals have sometimes not recommended that water utilities purchase the ground where their production wells are located, he said. That might be changing.

"We're getting to that point," he said, "just so we can control what's going on in that area."

### Over-application not limited to ag

The water community has only about 60 years of experience understanding the environmental effects of chemical fertilizers, Marks said.

Ag producers have done a "much better job" of applying nitrogen and phosphorous to their fields, he said.

"Those are input costs that you can control," he said. "Most farmers aren't (over-applying fertilizer) on purpose. Some are, but most aren't."

He remains concerned about "urban farmers" who have a tendency to over-apply fertilizers up to four times the recommended amount.

"My dad was one of the worst," Marks said, explaining that if the directions called for half a bag of fertilizer for his yard, he would apply the entire bag so as to not let it go to waste.

Of particular concern for Marks is the scientific studies that have found that certain fruit and vegetable juices, as well as dark leafy greens, contain levels of nitrates that far exceed the EPA maximum contaminant level of 10 parts per million for drinking water.

"It appears there's a real disconnect between the FDA and the EPA," he said. "You have to have some standards, there's no doubt about it. But that just doesn't make sense to me."

### Future threats

While source water protection is top of mind for many water systems, drought conditions are a growing concern for all areas of the state that rely on groundwater, Marks said, even in traditionally wet locations such as north-central and northeast Kansas, where water wells drilled in the 1930s are running dry.

"They're getting just enough water to keep things alive, but they're not getting enough for recharge," he said.

"We have been designing wells with a lifespan of 30 to 50 years. Now we have to guess what water levels will be like in that timeframe. Hopefully they'll still be usable in that timeframe.

"We're fixing to see some real water fights."

Water quantity isn't the only concern on Marks' horizon. Scientists in Canada and the United States are finding indications of pharmaceuticals in surface water and artificial sweeteners in groundwater, possibly leaching from septic systems.

"These are things that may have more significant impacts than nitrates," he said. "I think we'll see some changes down the road as far as sampling goes."

*Sarah Green is a writer, editor and consultant. A graduate of the William Allen White School of Journalism and Mass Communications at the University of Kansas, Green has written for local and national publications including The Hutchinson News, the KHI News Service and Saveur magazine. She lives in Wichita.*



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