by Douglas S. Helmke, L.G.

Sand pits and public water supply wells

When I was a young boy in Kankakee, Illinois my parents paid for a membership at the Chebanse Recreation Center. I thought that sand pit was heaven on earth. At least once a week, mom would load us in the '64 Plymouth Belvedere and head south on U.S. Highway 45/52. In the late 60s, this highway was receiving less maintenance than it did before I-57 was built a few miles to the west. The thump-thump-thump as we hit the expansion joints at 70 miles per hour was a prelude to fun in the hot sun and cool water of the sand pit. Dad and I went fishing there one evening after the beach was closed to swimming for the day and I caught my first largemouth bass. It was a thrill to watch that fish chase my Lazy Ike through the shallow water just a few feet from the beach. Only after dad told me to slow down my retrieve did I finally catch him on the third or fourth cast. I loved that place.

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That Illinois sand pit was nothing more than a crater in the middle of the flat prairie. All we could see was water, the gently sloping beach on the north side contained by the steeply sloping sides up to the rim, and blue sky. I have no information about its history, although I'm pretty sure it was excavated by someone supplying sand for highway construction or maybe to the nearby Illinois Central Railroad. It was nowhere close to a river, unlike those sand pits in Kansas.

In *Groundwater Hydrology,* author David Keith Todd estimates that 90 percent of all developed aquifers consist of unconsolidated rocks, chiefly sand and gravel. These unconsolidated aquifers can be divided into four basic categories based on the manner of their occurrence, and three of the four are common in Kansas. Buried valley aquifers are those where the streams that created them are no longer present, like the Chebanse swim beach. These aquifers are important in the glaciated area of northeast Kansas. Plains aquifers, which are widespread, especially in south-central and western Kansas, are primarily recharged by precipitation and streams that flow over them. Water course aquifers are those with significant connection to streams or rivers. These aquifers typically have well sorted sand and gravel, are close to the surface, and have plentiful groundwater. In the Kansas River Valley, this water is important as it allows material to be efficiently withdrawn from the

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Looking west from Johnson County over the Kansas River which is hidden by the trees, one can see the location originally proposed to be the site of a sand pit which was be approximately 180 acres in size after the project was completed.

stream channel or off-stream pits by hydraulic dredging.

When unconsolidated sand and gravel are described as being well sorted, it means that most of the particles are about the same size. Wells completed in aquifers with well sorted material usually yield more water than poorly sorted material. Zones of gravel that have fine grains of sand packed around the pieces of gravel does not allow groundwater flow to the same extent as a similar sized gravel zone with no fine sand.

Because these stream channel alluvial aquifers have well sorted material, are easily recharged by precipitation and stream flow, and generally store good quality water, they are excellent sources of water for irrigators, industries and public water systems. A count of the number of wells in the Kansas Department of Agriculture - Division of Water Resources database finds that there are at least 3,300 water wells tapping an alluvial aquifer in Kansas.

This part of the Kansas River Valley was proposed to be the location of a Lafarge North America Inc. sand and gravel extraction project. The well house for Leavenworth RWD 7 can be seen at the right of this photo.

The grains of sand and gravel in most Kansas aquifers are probably erosional remnants of the ancestral Rocky Mountains. The strength of this material is understandable if one realizes the number of miles these individual grains have tumbled across the

plains of eastern Colorado, southwestern Nebraska and western Kansas. This material is a key ingredient for high quality concrete used in highways and buildings.

Competition for resources

Even before the early days of statehood, competition in the Kansas River Valley existed. One can assume that there were preferred locations to cross the river that the native tribes controlled for their security. Pioneers heading west on the Oregon Trail paid tolls to use Pappan's Ferry at present day Topeka or attempted to cross at another location. Competition with nature was always present and devastating when floods or drought occurred. Settlement brought more competition for the resources of the valley which continues today. Continued growth of the Kansas City metropolitan area and the Kansas River corridor depends on the availability of high quality sand and gravel from the Kansas River Valley.

In recent years, the sand and gravel industry has been getting publicity in northeast Kansas, and not all of it is good. In Shawnee County, some rural residents are unhappy with the truck traffic and the damage the trucks are causing to the roads in their neighborhood. Other groups are concerned with the changes the dredges may be causing to the river bottom and the banks because of excess sand removed from the channel. The intent of this article is not to explain the regulatory roles of the U.S. Army Corps of Engineers or the Kansas Department of Agriculture-Division of Water Resources. It will not present the views of those wanting to protect the Kansas River and the Kaw Valley or those of the aggregate and construction industries. This article is to emphasize the need for proactive, defensive planning to protect your water system.

Cooperating for a solution

Up until this past summer, there doesn't appear to have been any direct conflict in Kansas between a sand and gravel extraction project and a public water system. Earlier this year however, it was brought to the attention of the board of Rural Water District 7, Leavenworth County, that Lafarge North America, Inc. was preparing plans to locate a sand pit in the area of their well in the Kansas River Valley. The district only has two wells; the other well is located in a buried valley north of the river. The valley well was drilled in 2003, as part of a project by the district to develop a water supply. If the pit were allowed to be opened as originally proposed, there was a significant risk that the well would be declared to be under the influence of surface water, resulting in the requirement to replace the well or build a previously unneeded surface water treatment plant.

District 7's valley well is located in Wyandotte County, and even though the well is not located within the corporate boundaries of the City of Bonner Springs, the city's planning department has jurisdiction over the area. Considering that almost all of District 7's customers are in Leavenworth County, and that the district purchased water from the City of Bonner Springs until their wells went online just a few years ago, one could conclude that the planning department might not have as much sympathy for the district as they would their own utilities department.

District 7 worked with Lafarge directly to find a solution to their concerns before the zoning hearing. The development of a solution before a potentially emotional hearing was held would likely be more successful. District 7 had their geologist review the information provided by Lafarge, and it was determined that the district would ask for the pit to never be any closer than 1,000 feet

This quarrying machinery east of Topeka is typical of sand and gravel extraction projects. After material is pumped from the pit, it is run through a series of sorters, resulting in piles of uniform sized sand and gravel for various uses.

from the well. If the proposed pit were to be located up gradient from the well, a greater distance would have been required. To prevent the potential settling of the sand and gravel deposits in the aquifer, it was determined that haul roads would need to be located at least 400 feet from the well and that any haul road within 400 feet to 900 feet would need to be maintained so as to minimize vibrations from any vehicles. Water sampling wells would be drilled and made available to the district for water level and water quality sampling purposes. Lafarge agreed to utilize oil and fuel storage and containment facilities which would minimize the potential for contamination. Lafarge would also refrain from using any chemical or herbicide that would cause an unreasonable risk to surface and groundwater supplies.

In spite of the agreement that was apparently reached between Lafarge and District 7, Lafarge was not successful in changing the zoning from agricultural to industrial use because of other local opposition. Failing to win approval of the zoning change, the issue of the special use permit was not heard. For now, all is well. However, it is likely that this area will be considered again, if it is believed to be an economically viable project. With greater demand and less supply, the search for economical supplies of sand and gravel will continue.

This example shows that a wellhead protection plan should not only address the existing activities that could contaminate a water supply, but also anticipate activities that could be established later. Because of the shrinking, economically available supplies of sand and gravel in the Kansas River Valley, water systems with wells in the Kansas River alluvium would serve themselves well to adopt a wellhead protection plan that keeps sand pits from changing the classification of their groundwater, in addition to controlling fertilizers, fuels and other wastes. Water systems in the remainder of the state should also take heed as the economy grows, or at least changes in unexpected ways. Having a plan in place will at least provide the structure to quickly respond to any new industry or activity that may threaten a system's water quality or quantity.

The Kansas Rural Water Association provides assistance to public water systems to develop wellhead and source water protection programs. Call KRWA at 785/336-3760 or e-mail me directly at dhelmke@krwa.net if you would like additional information. I would also be pleased to attend any meeting of any city or water district to discuss the importance of protecting a system's critical water sources.

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