



Excess Selenium Causes City of Gove to Make System Improvements

These chalk formations are about 80 million years old and were designated as the first National Natural Landmark by the U.S. Department of Interior in 1968. The site, Monument Rocks, is located approximately twenty miles southwest of Gove, KS in Gove County.

Gove is located in Gove County in northwest Kansas about ten miles south of Interstate 70 on Kansas Highway 23. The Gove County economy is predominately agricultural as most of the county is relatively flat with excellent soils. The county does have the Smoky Hill River traveling through the entire county from west to east. In the western part of the county just north of the Smoky Hill River and about 26 miles south of the city of Oakley is an amazing natural landmark known as the Monument Rocks, also referred to as the chalk pyramids. These chalk formations are about 80 million years old and rise about 70 feet in height. The site was the first National Natural Landmark designated by the U.S. Department of Interior in 1968. About 31 miles to the east and about 11 miles south of the city of

Quinter is another landmark known as Castle Rock. In January 2008, the Monument Rocks and Castle Rock were jointly named as one of the “8 Wonders of Kansas”. Anyone interested in learning more about these landmarks is invited to search the Web as there are a number of sites dedicated to these wonders.

The city of Gove was founded in 1885 and is located near the center of the county. The city was designated as the county seat in 1886 and with a population of 80, has the distinct honor of being the smallest city in Kansas to serve as the county seat. In the early 1950s, residents decided to honor early settlers to the area with a special day known as “Old Settler’s Day”. This has become an annual event held in August with a parade along with other events throughout the day.

Gove's water system

The city's water system which dates back to the 1930s consisted of a well located at the southeast corner of town, a pressure tank, and distribution system. Throughout the years, the city added wells to the system and in the late 1980s, a 59,000-gallon glass-lined steel storage tank was added. A high service pump was installed to provide

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pressure to the system. Of the several wells drilled over the years, one is located north of town. That well is the primary reason for this most recent upgrade. The water from that well was found to contain selenium above the United States Environmental Protection Agency (USEPA) limits mandated in the drinking water standards. Tanner Tuttle, City Superintendent, stated that the Kansas Department of Health and Environment (KDHE) advised the city to discontinue pumping the well on a regular basis and to maintain it on emergency status only. This left the city with only one well at the southeast corner of town that could be routinely used.



Selenium and health effects

Selenium is a metal found in natural deposits such as ores containing other elements. Selenium compounds are widely used in many products but its greatest use is in electronic and photocopier components. The major sources of selenium in drinking water are discharge from petroleum and metal refineries, erosion of natural deposits, and discharge from mines. The EPA has set an enforceable regulation for selenium, called a maximum contaminant level (MCL), at 0.05 milligrams per liter (mg/L) or 50 parts per billion (ppb). It is believed that this level of protection would not cause any of the potential health problems. With present technology and resources, this is the lowest level to which water systems can



Workers install the electrical panel at the new well on the southeast edge of town. The south wells each have a capacity of 70 gpm and the north well has a capacity of 50 gpm.



These photos show various stages of the construction of the new blend/chlorination building. Note the standpipe and old booster pump building in the background. The old building will be removed.

reasonably be required to remove selenium. Selenium is an essential nutrient at low levels. However, the EPA states that some people who drink water containing selenium well in excess of the MCL for many years could experience hair or fingernail losses, numbness in fingers or toes, or problems with their circulation.

Selenium not the only problem

There are several treatment methods that have proven to be effective for removing selenium to below the MCL. However, none of those were considered to be a feasible option for a city the size of Gove. Instead the city hired Wilson and Company, Inc., Engineers and Architects to design a project utilizing blending as an option. According to Doug Goetz with Wilson & Company, the driving factors for this project, in addition to solving the selenium issue, were problems with distribution system pressure when: 1) the well pump and existing booster pump operated at the same time; and, 2) the single booster pump at the standpipe failed or was taken out of service for maintenance or replacement



This is the Koflo static mixer installed to provide improved mixing. A stainless steel element inside the pipe spool will cause rapid mixing of the two well waters to lower the selenium concentration in the finished water.

The goal, of course, is to allow the north well to be returned to use while at the same time, provide water that will be in compliance with all drinking water standards, including selenium.

since the existing storage tank (standpipe) doesn't have sufficient height to provide adequate pressure.

Water system improvements

The improvements included constructing a second well at the southeast corner of town to allow either of the wells to be used to blend with water from the north well. The goal, of course, is to allow the north well to be

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This photo shows the new well at the southeast edge of town. This well and the existing well in this area will be used to blend down the selenium from the north well. The four yellow metal posts laying on the ground will be installed around the perimeter of the well for protection.

returned to use while at the same time, provide water that will be in compliance with all drinking water standards, including selenium. The selenium concentration at the north well has been as high as 73.7 ppb. By blending, the selenium level in the water to customers will be below the MCL of 50 ppb. Obtaining approval to drill a second well near the existing south well required close work with the Department of Agriculture, Division of Water Resources. Ned Marks with Terrane Resources, Stafford, KS, was the geologist on the project who assisted with a portion of the water rights coordination (changing point of diversion from single well to a battery arrangement) and well development/design. Other improvements include constructing 3,080 feet of 3-inch supply line from the wells to a new booster pump/blending building. System pressure fluctuation throughout the city should be eliminated or at least be minimized by routing all water to the new pump station and storage tank. To improve blending, all well and booster pumps were provided with variable frequency drives (VFDs) and a “static mixer” was installed in the line inside the booster pump building. Chlorination was moved from the wells to the booster pump building. Sodium

hypochlorite is being added to the water within the building and the dosage will be controlled automatically based on the flow. Also, piping modifications were made at the storage standpipe with the installation of separate inlet and outlet pipes. The inlet pipe was extended upward 35 feet to provide more detention and blending time.

Project funding; rate impact

Funding for this project was a combination Community Development Block Grant (CDBG) of \$236,000 administered by the Kansas Department of Commerce and a Kansas Public Water Supply Loan of \$269,327 administered by the Kansas Department of Health and Environment. Water rates are projected to increase from the current level of \$21 to an estimated \$40 for 5,000 gallons. Final construction is not yet completed; usage rates will be finalized at that time. Aqua Pump of Gove, KS is the prime contractor on the project.

Bert Zerr is currently a consultant with KRWA. He has been with KRWA since 2005. Prior to that, Bert was a District Engineer with the KDHE in the Salina District Office for 32 years.



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