

City of Woodston Makes Major Water Supply Improvements

This photo shows one of the two double-lined lagoon cells that are part of the Woodston water treatment operation. The lagoons contain the concentrated nitrate and brine waste water. An observation manhole is provided to monitor water that seeps through the first liner which is then contained by the second liner and allowed to flow and collect in the manhole.

Woodston is a small community located in Rooks County along US Highway 24 about ten miles east of Stockton, the county seat. Rooks County is located in northwest Kansas, halfway between Denver and Kansas City at the eastern edge of the Great Plains. The city, which was founded in 1885 primarily because the railroad needed another town between Alton and Stockton, is located in the Solomon River Valley. Like so many of the communities along the Solomon River, they enjoy an agricultural heritage due to the very fertile soil conditions in the valley.

Woodston has utilized groundwater as the source of water for many years. Unfortunately though, since the early 1990s, the city has experienced nitrate levels above the maximum contaminant level (MCL) of 10 milligrams per liter (mg/L). Each violation resulted in the ever annoying public notice requirement and the fact that eventually the city would be required to bring their system into compliance with the nitrate MCL. The requirement to bring the system into compliance did occur a few years ago as the city and the Kansas Department of Health and Environment (KDHE) entered into a consent agreement to bring the system into compliance.

Nitrates are very soluble and tend to move through soils, eventually ending up in groundwater. In water, nitrate has no color, no odor, no taste, and can only be detected by testing. The Environmental Protection Agency (EPA) established a

MCL of 10 mg/L to protect public health, especially in infants. Water containing high nitrate can cause methemoglobinemia, also known as infant cyanosis or blue baby poisoning in infants less than six months of age. This occurs because the conversion of nitrate to nitrite by bacteria in the stomach interferes with the oxygen-carrying capacity of the child's blood. Usually at around six months of age, a



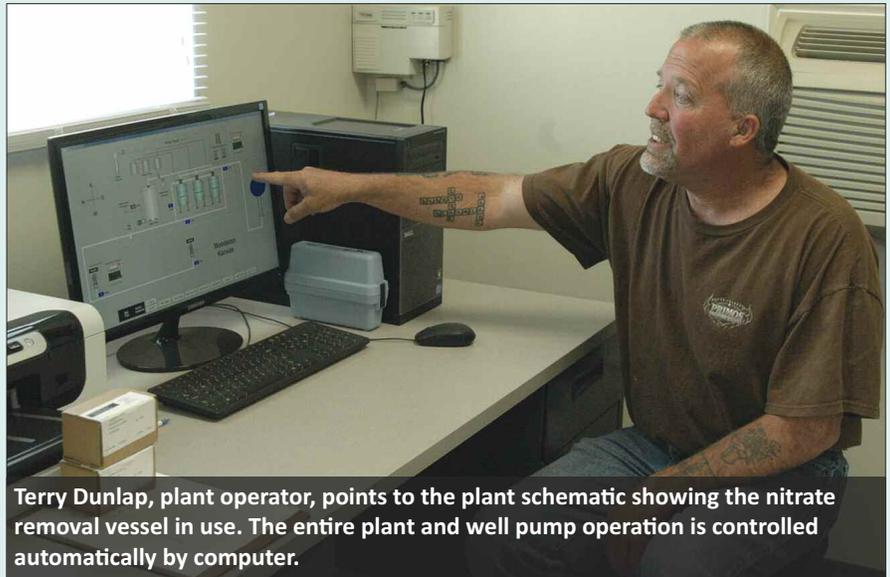
This photo shows the relative location of the black tanks with salt brine solution used to regenerate the resin in the exchange tanks, waste water storage tank, and the forklift used for handling pellets of salt bags.

child's digestive system should be fully developed and should no longer suffer from the effects of nitrate poisoning.

Considering options

Ron Turnbull, former councilman, is retired from the Goodyear Tire and Rubber Company and by his own admission, had the time to be on site throughout the system upgrade. He stated that the city first considered looking for groundwater that would comply with the nitrate standard. He noted that the city checked private and irrigation wells in the area and found that most wells had high nitrate levels, some as high as 35 mg/L. As a result, the city felt that even if they could locate wells lower in nitrate, it would be only a matter of time before they would have problems again with nitrate. The only problem though was that Woodston, with a population of only 136, could not afford to make improvements to the system unless financial assistance could be obtained.

The next step taken by the city was to search for and hire an engineering firm to lead them through the process and to design a project. Ron Turnbull stated that after researching the issue, the city made the decision to pursue the construction of a nitrate removal plant. Also, if sufficient



Terry Dunlap, plant operator, points to the plant schematic showing the nitrate removal vessel in use. The entire plant and well pump operation is controlled automatically by computer.

funding could be secured, the city would include other improvements in the overall project. Eventually the city was able to obtain funding utilizing funds as directed by the American Recovery and Reinvestment Act (ARRA) from the following sources: \$344,000 from the Department of Commerce in the form of a Community Development Block Grant (CDBG) along with a grant of \$455,000 and loan of \$360,000 from the United States Department of Agriculture Rural Development (USDA-RD).

Why the City Sent Personnel to Wichita

By Joe Cabrinha, Mayor, City of Atwood (As published in the *Rawlins Co. Square Deal*, 4/18/2013)

Each year at the end of March, the Kansas Rural Water Association holds an annual conference. This conference offers many important opportunities for the city in regard to our water and wastewater systems.

For the city crew, it offers annual water and wastewater certification instruction and testing. For the water clerk, it offers administrative updates. For the city attorney, specific water and wastewater case law is discussed. For the city council and mayor, it offers governing body instruction and seminars.

This conference brings together all the water and wastewater people in the state of Kansas, including federal and state

regulators and funding agencies, consultants, engineers, academics and suppliers.

Over 40 various classes of instruction are offered, as well as day-long courses in subjects relevant to all who attend.

Besides attending many of the instructional sessions, we were able to meet with Ranson Financial, as the KRWA Finance Authority, regarding refinancing and utility rate evaluation, and USDA/Rural Development and Kansas Department of Health and Environment regarding possible funding for wastewater collection system improvements.

In each case, we were accompanied by a principal of Miller and Associates, the city

of Atwood's consulting engineer for this project. At no other place and time are all these people available together in one location.

About 2,200 people from 250 or more cities and rural water districts attend the annual KRWA conference. Most of the attendees are water and wastewater operators from rural communities like Atwood.

The benefits that accrue to the city from these conferences offer the opportunity to certify our operators, improve our utility operations and gain favorable funding for our projects. This is time and money well spent for now and into the future.



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– Joe Cabrinha, Mayor



Well No. 4 was rehabilitated with new piping and a new 15 HP pump and motor. A standby generator was also provided at this well.

With a total of \$1,159,000 available to improve the system, the city set their sights on also improving their water source. The improvements included eliminating the existing Well No. 3, which had nitrate values as high as 13.0 mg/L, and replacing it with a new well (Well No. 5). Well No. 4, which had nitrate levels as high as 10 mg/L, was completely refurbished with new piping and a new pump motor. The existing 10 HP pump motor was replaced with a 15 HP motor. Each well is capable of producing 160 gallons per minute (gpm).

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The nitrate removal plant is an ion-exchange unit that operates very similarly to home water softeners in that sodium chloride (salt brine) is used in the regeneration procedure. The main difference of course is the type of resin used in the exchange vessels. Nitrate removal exchange vessels utilize anion resins that are nitrate-selective, preferring nitrate over other competing contaminants. The plant in Woodston has three vessels, each having a capacity of 160 gpm. The flow through the vessels is controlled automatically by a computer. This allows for continuous operation by switching from vessel to vessel after a predetermined volume passes through each vessel. Each vessel was designed for 151,200 gallons to flow before switching to the next vessel. Currently, all water

being pumped from the wells is being treated and the nitrate level in the finished water is around 2.2 mg/L. Plans are to eventually allow enough raw water to bypass the treatment system so the nitrate level leaving the plant will be in the 4.0 to 4.5 mg/L range. Standby generators were provided at both the treatment plant and Well No. 4.

As in all water treatment plants, there is a waste stream that needs to be processed. At each vessel, 1,730 gallons of wastewater consisting of

backwash water and wastewater from the regeneration process flows to a two-cell double-lined lagoon system.

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ROBERT L. VINCENT, C.P.G., P.H.G.
GROUND WATER GEOLOGIST



The nitrate removal plant for the city of Woodston includes these three fiberglass exchange vessels and related piping. The tanks contain nitrate selective resin provided by Krudico, Inc. The regeneration process consists of backwash at 40 gpm for 10 minutes, brine draw slow rinse at 20 gpm for 25 minutes, slow rinse at 10 gpm for 35 minutes, and fast rinse at 40 gpm for 12 minutes.



Former Woodston city council member Ron Turnbull says that the plant building was oversized to allow for additional treatment units if needed in the future. His comments were referencing potential future regulations that might require plant expansion.

High-density polyethylene (HDPE) is the material used to line the lagoon cells. The double lined lagoon provides for the containment of the wastewater and allows the city to check for any fluid loss by checking the monitoring manholes. KDHE requires a waste handling system that will prevent any loss of contaminants such as sodium and chloride.

Water rates prior to this upgrade were \$23 for 3,000 gallons plus \$1.00 per thousand for all water in excess of the minimum. Rates increased to \$36 for 5,000 gallons and \$1.50 per

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thousand. The city also sells water to Rooks County Rural Water District No. 1 and by contract, can provide up to 1.5 million gallons per month at the following monthly rate: \$60 minimum plus \$2.25 per 1,000 gallons. Water sales to the rural water district average between 0.75 and 1.0 million gallons per month. When asked if he had any advice to other systems in the same predicament, Ron Turnbull suggested that systems shop around

for an engineering firm with the appropriate experience. He stated also that the city was very satisfied with Don Hellar, project engineer and Kevin Powers, inspector on the job, both with EBH & Associates, Pratt, KS. He was also very complimentary of the work performed by the contractor, APAC-KS, Shears Div., Hutchinson and Clark Well, Great Bend.

If your community has water quality issues and you would like to have a discussion about options and other experiences, give KRWA a call and someone from the Association would be pleased to attend a city council meeting or work session or your rural water district board meeting.



This photo shows the new well (No. 5) that was drilled by Clarke Well & Equipment, Inc., of Great Bend, KS. This well is a replacement for Well No. 3 which had the highest nitrate values and was abandoned.

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.

