Reclaiming roughly 1.5 billion gallons annually of municipal and industrial wastewater for crop irrigation has been a team effort that’s worked for 26 years in Dodge City, KS. The city’s water treatment plant even has numerous awards from the USEPA and the Kansas Department of Health and Environment accumulated over the years to prove it.

But bringing the wastewater, 70% of which is comprised of water high in sodium and nitrates from the local National Beef packing plant, to fields for crop use isn’t a simple task.

The industrial water from the plant is first processed in three covered anaerobic lagoons where bacteria break down the waste, says Shane Smith, wastewater project manager for engineering firm, CH2M Hill, which is contracted with the city to manage the waste.

After 12 days of detention time in the anaerobic lagoons, National Beef’s wastewater is then pumped into three aerobic lagoons where it is aerated and mixed with the municipal water. The water then flows into 200 surface-acre storage reservoirs that are 18-ft deep and hold more than 700 million gallons. From there, the water is delivered to nearby fields via irrigation center pivots where the nutrient-rich water is put to agricultural use on non-food crops. Wastewater irrigation on crops meant for human consumption is not allowed.

Chuck Nicholson, a farmer and CCA who farms with his sister Deketa Schuckman, irrigates between 6.5 million and 7 million gallons of wastewater each day through center pivots on roughly 3,200 acres of farmland.

“When it comes out from the plant, it’s called grey water, but it’s actually greenish brown. Believe it or not, the municipal water is just clear,” Nicholson says.

Because the water contains more nitrates than the crops can utilize, nitrates accumulate in the soil over time and work their way deeper into the profile. Sodium that occurs naturally in the water but becomes concentrated after being condensed down and evaporated when used for cooling in the packing plant, meanwhile, accumulates on the soil surface when irrigated.

An intensive soil-testing program is therefore required to track both nitrate and sodium accumulation levels with Servi-Tech Laboratories in Dodge City, a crop consulting and agronomic service company, sampling down to 50 ft in the soil profile with samples collected at various intervals.

“We have two monitoring sites on each one of the center pivots, and we sample those twice a year,” says CCA Fred Vocasek, an environmental consultant with Servi-Tech in Dodge City who has been working on the wastewater management project since its inception. “We’ve done that every year since 1987.”

The groundwater is also sampled at 17 different locations before and after the irrigation season to monitor water quality, Smith adds. Sampling normally occurs from mid-November to mid-December and then again in February or early March.

After Vocasek collates the abundance of data, he reports the information in an annual meeting with Nicholson, a private crop consultant, and representatives from National Beef, the city of Dodge City, and CH2M Hill to review progress of the year before and plan for management strategies.

Managing nitrates with alfalfa

One management strategy to recover some of the nitrate that the wastewater adds to the soils is using non-nodulated alfalfa as it scavenges for the nitrates deep in the soil profile.

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