

KRWA Wastewater Tech Charlie Schwindamann checks sludge depths in the primary lagoon cell and collects a composite sample for heavy metals analysis.

Consequences of Not Knowing What's in Hauled Sewage Could Cause Big Problems



Whenever staff with Kansas Rural Water Association (KRWA) are asked to investigate the causes for non-compliance by lagoon systems, we never know where that path may take us. Generally, the obvious causes are reduced detention time caused by excessive inflow and infiltration (I&I), excessive sludge accumulation or poor transfer structure location that causes short-circuiting. But occasionally we find causes we would never suspect. Such is the case I recently encountered while helping a small community in eastern Kansas served by a three-cell discharging lagoon. While not presently having any serious compliance issues, the city's lagoon effluent quality has been slowly deteriorating over the past several years.

The lagoon in question was upgraded about ten years ago due to problems meeting permit limits. At that time, the city was served by a two-cell lagoon with a combined surface area of 4.4 acres; the lagoon did not provide adequate detention time. The population of the city then was approximately 840 people. The Kansas Department of Health and Environment (KDHE) required the city to retain an engineering consultant to investigate the causes of high effluent BOD and to recommend options for returning the city's lagoon to compliance with effluent limits. The engineering report recommended several improvements to

both the city's collection and treatment systems, including:

- Identification of private sources of I&I and enforcement of city ordinances to ensure property owners eliminate such sources
- Inspections of all manholes and repairs made to those that are a source of I&I
- Cleaning and televising of all sewer mains; the video data would then be used to identify structural defects and help determine best method for rehabilitation; it was recommended that emphasis be given to larger, trunk sewers causing wet weather bypasses or those that were significant sources of I&I
- Expanding the existing two-cell lagoon system to a three-cell system designed to serve a projected population of about 1,100 people; this was accomplished by expanding the primary cell (by moving existing dikes), removing sludge from the original primary cell and adding a final, third cell; it should be noted that the city's population today has actually decreased to fewer than 700 people

The upgraded lagoon now has three cells with a total surface area of 10.35 acres. The third cell was also provided with a new outfall structure that allowed drawing effluent from two different depths to help produce the best quality effluent possible. The improvements returned the lagoon to compliance within permit limits. However, for the past few years effluent results for BOD, TSS, ammonia and E. coli have been slowly increasing.

Then in early 2014, the NPDES permit for the city's lagoon came up for re-issuance. Municipal lagoon permits are generally issued by KDHE for a five-year period. As part of the re-issuance process, KDHE conducts a detailed review of the facility looking at KDHE inspection reports, monitoring data and all correspondence in their permit files. KDHE's review

confirmed that while effluent limits for both BOD and TSS were being met, there was also a trend indicating effluent quality was slowly deteriorating. KDHE found effluent ammonia results were erratic ranging from 0.12 mg/L to 7.98 mg/L. Effluent E. coli results have also been increasing slowly from a low of ten colonies/100 ml to a high of 1,300 colonies/100 ml. This data and these trends caused the KDHE review engineer to conclude if effluent ammonia and E. coli concentrations continue to increase, the city's NPDES permit may eventually be modified to require more frequently monitoring and include limitations for both parameters. The city is currently on quarterly monitoring.

The KDHE review engineer then found a possible cause for the slow deterioration in effluent quality. The city had accepted more than 2,000 loads of septage from septic tank haulers during 2013. To put this number in perspective, many small communities served by lagoons will not even accept such wastewater. That is also the case for some larger mechanical treatment plants that might actually be better able to treat such wastes. KDHE asked the city if they wanted technical assistance with the issue of accepting unregulated septic tank wastes. The city was referred to KRWA for assistance. For the past four months, KRWA staff have been helping the city get a handle on the issue of accepting hauled waste and what the possible implications could be if this practice continues in the future.

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What is septage?

Septage is defined as the partially treated sewage (both liquid and solid) stored in septic tanks and cesspools. Septic tanks can serve both residences and non-residences such as commercial or industrial facilities. Septage can also be defined as partially treated sewage from other sources like grease interceptors, RV dump stations and portable toilets. By its very nature, the constituents in septage are more concentrated than in typical domestic sewage. Septage is normally characterized by large quantities of grit, grease and solids and usually has an offensive odor as it is anaerobic (without oxygen). According to the EPA Handbook: Septage Treatment and Disposal, septage contains many of the same constituents as normal domestic sewage, but in a higher strength, more concentrated form. For example, normal domestic sewage has a typical biochemical oxygen demand (BOD) concentration of 150 to 200 mg/L. According to the EPA Handbook, septage has an average BOD of 7,000 mg/L. Normal domestic sewage has an average total suspended solids (TSS) concentration of 200 mg/L. Septage has an average TSS of 15,000 mg/L. With regard to nutrients such as nitrogen and phosphorus, septage is again more concentrated. It should be noted that the same EPA Handbook states that when comparing pathogens, there is very little difference in concentration between domestic sewage and septage.

Regardless, it is safe to say that treatment of septage presents unique problems due to its concentrated nature. I would also like to note here that there is a difference between wastewater pumped from holding tanks versus septic tanks. While septic tanks tend to concentrate pollutants such as BOD (organic matter), solids and nutrients, holding tanks do not as they do not have a lateral field component like septic systems do. Since holding tanks hold all liquid and solid components of sewage, their contents can be very similar to domestic sewage discharged by residences connected directly to a municipal collection system. However there is a difference in that holding tank wastewater is generally more septic or anaerobic than normal domestic sewage due to the fact it is stored for weeks or months before pumping and thus is void of oxygen.



New sign at city's dumping station now informs haulers they must obtain a key from city hall to access station. Otherwise, the station is kept locked at all times.

KRWA staff have been working with the city's operator and council to qualify and quantify how much hauled septic tank waste is being accepted. Based on data provided by the city clerk, the number of loads have been slowly increasing ever since 2009. For example, the city accepted more than 1,300 loads in 2009 and 2011, more than 1,600 loads in 2012 and then almost 2,200 loads in 2013. Much of the hauled wastewater is domestic sewage coming from neighboring lake

communities with on-site residential holding tanks. However some of it could also be wastewater pumped from septic tanks which would have a much higher concentration of solids and thus, a higher BOD and TSS concentration. The city has also observed haulers bringing in grease after pumping out commercial grease traps at restaurants. Again, this is another source of high-strength wastewater that lagoons are not generally able to treat without problems. And finally, there is always

the possibility of haulers bringing in wastewater from commercial and industrial facilities which could present all sorts of problems. Such wastewater could be toxic and interrupt the biological treatment process in the lagoon. Such wastewater could also contain heavy metals which if the concentration is high enough, could make sludge in the lagoon unacceptable for land application should desludging ever be required.

It should be noted that presently, the city already has a large mound of solids at the end of the influent pipe to their primary cell. The top of the mound is visible from the lagoon dikes and is impeding flow into the primary cell. The city has tried to disperse this mound by using their jetter and fire truck. But so far, neither approach is dispersing the mound of solids away from the end of the influent pipe. Other problems include the primary cell experiencing prolonged seasonal turnovers resulting in treatment and odor problems. Additionally, the primary cell has more than a normal amount of plastic, paper and rubber products around the periphery.

KRWA staff have also checked all three cells to determine if sludge depths are excessive. Remember, sludge was removed from the primary cell of this lagoon only ten years ago. Fortunately, it does not appear that excessive sludge is presently a problem, other than the mound at the end of the influent pipe in the primary cell. Regardless, if the city continues to accept unregulated loads of hauled sewage, they may be faced with another sludge removal project sooner than expected. Sludge removal is expensive.

KRWA also recommended that sludge samples be collected while checking sludge depths and analyzed for heavy metals. A composite sludge sample was collected recently and analyzed by the city's certified laboratory. Since the EPA Part 503 Biosolids Rule places limits on heavy metals for sludge that is land applied, it was recommended the city determine if

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the lagoon sludge may have already exceeded some of the ceiling limits for metals due to accepting unregulated hauled septage. Fortunately, the composite sludge sample met the ceiling limits for all nine regulated metals and land application is still possible. If land application cannot be used due to high concentrations of heavy metals, sludge disposal options become very limited and expensive.

To date, the city council has become more knowledgeable and aggressive in regulating any hauled sewage they accept. The city has no choice. To ignore the problem is to take on liability that could cost the city dearly in the future. Possible consequences include having to expand the lagoon treatment system prematurely because effluent limits are not being met. As mentioned previously, other consequences include having to remove sludge sooner than expected or not being able to land apply the sludge if heavy metal limits cannot be met. Having to solve such problems can be a very expensive proposition for a small town. The city has already instituted several new policies regulating hauled wastewater including:

- A price increase from \$15/1,500 gallon load to \$45/1,000 gallons. That price has since been decreased to \$0.017 per gallon (or \$25.50 for a 1,500 gallon load) with the understanding that the city council will be implementing yearly price increases. The city wants to establish a reserve fund just in case accepting hauled wastewater causes problems in the future.
- Haulers must now complete a manifest for each load, confirming where the load came from and how many gallons they are carrying.
- The city's dumping station is locked and haulers must now go to city hall to get a card to access the station. The station is no longer open 24/7. It is open Monday to Friday, from 8 a.m. to 4:30 p.m.



This dumping station in a small eastern Kansas town received approximately 2,200 loads of sewage in 2013. The adjacent manhole is accessible once the gate is unlocked and the metal bar is opened.

- The city is only accepting sewage from haulers within the county. Before, haulers were coming from other counties and even out-of-state.
- The city has informed haulers that they may be collecting unannounced grab samples from their tanker trucks in the future for analysis by a certified laboratory. These samples would be collected to confirm that information provided by the hauler on the manifest is indeed accurate as to what type wastewater the city is accepting.
- Finally, the city is considering developing penalties should any of these policies be ignored or violated.

But the city has an obligation to their city customers to protect their sewage treatment system and to make sure the useful life of the system is not significantly shorten due to accepting unregulated hauled wastewater.

At a recent city council meeting, I encouraged the city to continue working to better regulate the hauled sewage they accept. As expected, the city council is not very popular with haulers right now due to some of the aforementioned changes. But the city has an obligation to their city customers to protect their sewage treatment system and to make sure the useful life of the system is not significantly shortened due to accepting unregulated hauled wastewater. I think most of the haulers understand, but the city is under no obligation to accept any hauled wastewater. It is a service the city has provided in the past and will likely continue to provide in the future. But the city has a responsibility to better regulate the hauled sewage they accept so there are no liability issues or other surprises in the future.

Jeff Lamfers began work for KRWA in November 2008. Jeff has more than thirty years of regulatory experience in the oversight and operation of water and wastewater systems with the Kansas Department of Health and Environment.



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