



KDHE – KRWA Referral Program Addresses Wastewater Effluent Violations at City of Mound Valley Small Wastewater System Case Study

City of Mound Valley, Kansas



★ Mound Valley

Wastewater systems across the nation are required to comply with their National Pollutant Discharge Elimination System (NPDES) Permits concerning discharges. This case study discusses the Kansas Rural Water Association (KRWA) work on a referral from the Kansas Department of Health and Environment (KDHE) for the city of Mound Valley.



This photo shows the quality of effluent entering the discharge box before improvements. This is effluent off the surface of the lagoon. Notice the wastewater contains a lot of excessive solids, primarily due to algae.

Mound Valley is a small community located in Labette County in southeast Kansas. Mound Valley’s population is 375 people. The city was founded in 1869 and was named for the mound-like hills in the vicinity. A two-cell discharging lagoon system serves Mound Valley with a rated design flow of 28,900 gpd. That flow is based on serving approximately 400 people contributing 70 gallons per person per day. The lagoon has a total surface area of 3.0 acres, with Cell 1 covering 2.0 acres and Cell 2 covering 1.0 acre.

The city was referred to the Kansas Rural Water Association in July 2018 due to several effluent violations, primarily Biochemical Oxygen Demand (BOD). The city’s NPDES Permit requires quarterly monitoring when the lagoon discharges and has a BOD effluent limit of 30 mg/l (monthly average). The city’s lagoon exceeded the BOD limit on two occasions during both 2017 and 2018. Another violation occurred in June 2019. KDHE considered these violations sufficient enough to refer the city to KRWA. The Association provides technical assistance to wastewater systems experiencing compliance issues under a contract funded by KDHE. The city’s permit also contains limits for Total Suspended Solids (TSS) which is met consistently. Monitoring is also required for pH, ammonia and E. coli, but none of those parameters have effluent limits.

This example of technical assistance was provided by the Kansas Rural Water Association under a referral process and contract funded through the Kansas Department of Health and Environment.

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Several KRWA staff have been involved in helping Mound Valley over the years. These include Charlie Schwindamann, Jason Solomon and Jeff Lamfers. Even prior to the referral by KDHE, KRWA provided assistance. In April 2015, Wastewater Tech Charlie Schwindamann checked sludge levels in the city's lagoon and found two interesting facts. They were: 1) Sludge levels were sufficient to recommend the city may need to consider removal; and, 2) The total water depth in each cell was ten feet. This water depth was confusing to both the city and KRWA staff initially as most facultative lagoons operate around the four to six-foot water depth. It was later discovered that the lagoon dikes had been raised to prevent water from a nearby private pond from flowing into the lagoon. Operating a lagoon at such great depth can cause several problems, including a more significant potential for developing offensive odors and treatment issues.

Charlie Schwindamann also smoke-tested the city's collection system in April 2018. A total of 52 infiltration and inflow sources were identified. It was Charlie's opinion that the most significant I&I sources were due to deteriorating service lines and manholes. Unfortunately, several of the manholes were located in low areas near drainage ditches. The city has eliminated some of these sources, but controlling I&I is an ongoing battle as it is for most wastewater systems.

The issues of excessive sludge and excessive I&I were already known and recognized before the city was referred by KDHE to KRWA in July 2018. However, another interesting problem was uncovered by KRWA Tech Jason Solomon and City Superintendent Rex Hess. It was suspected that the pipeline into the effluent box of Cell 2 was either plugged or buried in sludge. In December 2018, wastewater was pumped out of the effluent box in an attempt to unplug the line into this structure. They found there was no line into the effluent box. Instead, the lagoon was discharging off the surface of the final cell, through a round hole that had been cut into the side of the effluent box. This hole was approximately at the same elevation as the water level when it was two feet below the top of the exterior dikes. Discharging off the surface of any lagoon is strongly discouraged. It often results in an effluent high in solids due to floating debris and/or high concentrations of algae and other organic matter.

It was concluded that while the city was referred due to effluent BOD violations, higher than normal



This photo shows the extension before placement in the lagoon. Notice the 90-degree tee and 20-inch downward extension that allows drawing effluent from below the water surface.

concentrations of solids, especially algae near the water surface, could be causing the BOD violations. It is for this reason that many newer lagoons are now designed so that effluent is drawn from several feet below the water surface. This allows avoiding concentrated algae near the surface which can elevate effluent TSS and BOD. Algae are organic in nature and will therefore decompose if in an effluent sample being analyzed for BOD, just like sewage solids.

Experts claim that for every 1.0 mg/l of TSS in a water sample, as much as 0.5 mg/l of BOD is added. For example, it is not uncommon for a lagoon effluent sample to have a TSS of greater than 70 to 80 mg/l during summer months. If the 1.0 to 0.5 ratio is accurate, this same sample could potentially have a BOD concentration of 35 to 40 mg/l which would exceed the BOD limit of 30 mg/l. So, if effluent is being drawn off the surface, both TSS and BOD can be adversely affected and even result in compliance issues.

In November 2019, KRWA helped the city modify the effluent box to allow drawing effluent from below the water surface. A 10-foot section of 8-inch PVC plastic pipe was extended horizontally out into the lagoon from the effluent box. A watertight



The new pipe extension connects to the existing discharge box. KRWA Tech Jason Solomon and Rex Hess, Superintendent at Mound Valley, made sure the pipe made a watertight seal with the box.

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KRWA Tech Jason Solomon installs posts to support the 10-foot pipe extension.

connection was made where the pipe connects to the existing hole cut into the side of the box. And at the other end, the pipe was extended 20 inches down below the water surface using a 90-degree PVC tee. The pipe extension is supported by a couple of T-posts driven into the pond bottom and clamps.



Rex Hess, city of Mound Valley Superintendent, is shown with the new pipe extension in place and operating. Since this improvement was made, the lagoon effluent's quality has improved and now meets limits for TSS and BOD.

The Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. The basis of the CWA was enacted in 1948 and was called the Federal Water Pollution Control Act, but the Act was significantly reorganized and expanded in 1972. "Clean Water Act" became the Act's common name with amendments in 1972.

Under the CWA, EPA has implemented pollution control programs such as setting wastewater standards for industry. EPA has also developed national water quality criteria recommendations for pollutants in surface waters.

The CWA made it unlawful to discharge any pollutant from a point source into navigable waters, unless a permit was obtained:

- EPA's **National Pollutant Discharge Elimination System (NPDES)** permit program controls discharges.
- Point sources are discrete conveyances such as pipes or man-made ditches.
- Individual homes that are connected to a municipal system, use a septic system, or do not have a surface discharge do not need a NPDES permit;
- Industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters.¹

¹ US EPA. 2020. *Summary of The Clean Water Act* | US EPA. [online] <https://www.epa.gov/laws-regulations/summary-clean-water-act> [Accessed 10 September 2020].

See the attached photos. Depending on water depth, the lagoon is now drawing effluent from at least 20 inches below the water surface.

Since this modification was made to the effluent box, the lagoon has consistently met BOD limits. It is important to note that effluent TSS has also dropped significantly, especially during the summer months. This has translated to lower effluent BOD results even during summer months when TSS values are usually higher due to algae. For example, Mound Valley's June effluent BOD results for 2017-2019 ranged from 33 to 93 mg/l. The June 2020 effluent BOD result was 5.2 mg/l, which is well below the 30-mg/l limit. It is apparent that drawing effluent from 20 inches below the water surface is providing a better quality effluent all around. While it will take more than one year's worth of data to evaluate the improvements made to the effluent box, the results are very encouraging.

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. He is a graduate of the University of Kansas with a degree in Environmental Studies with an emphasis in aquatic biology.





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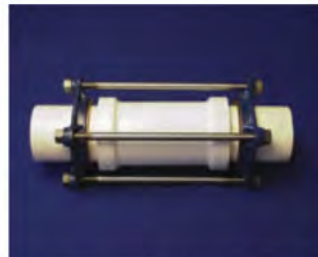
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