



Troubleshooting a Sewer Force Main Problem at Concordia, Kansas

City of Concordia workers load debris from broken force main on a sand bar in middle of the Republican River. Two dump truck loads were removed from the sand bar.

Late at night on April 5, 2015 (please note this date) I had just finished watching a movie on Turner Classic Movies. I was signing off for the day. I heard a beep on my phone indicating an email. I thought of ignoring it considering that it might just be a spam. But as Wastewater Tech, I receive emails and calls at all times of the day so I decided to check it.

As I looked to clear the message I noticed it wasn't spam, but it was a message from the Director of Public Utilities at Concordia, KS. He was requesting assistance with troubleshooting a lift station. The lift station is approximately 2.5 miles north of town, and north of the Republican River. The lift station presently serves only the local jail, but has potential for

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future services. The lift station normally pumps 10 to 15 times per day for just a couple of minutes each time. The report was that the pump was operating several hours per cycle; still there was no reduction in the level of the wet well. There is about 1,200 feet of uncased pipe bored under the Republican River with a depth of about 20 feet below riverbed.

The Public Utilities Director already had input from his personnel and they evaluated several options. Those included pigging the line, flushing with pressurized water or cutting a cleanout in the force main and use a sewer truck to clean the line. All these were good considerations: any would work to remove a plug of the sewer force main.

My first impression as I replied to the email was that the pump may have been plugged or that there was a large amount of debris in the wet well causing the flow to the pumps to be restricted. That would cause the cavitations and lack of pumping.

Also excessive air in the force main might cause the same issues. Air relief valves require regular basis maintenance to ensure proper operation.

I also sent a second email and suggested that if the pumps are submersible and if they are not properly seated or a bad seal at the seat, the result can be a lack pumping and cavitation. If they are the vacuum-prime type, a hole or leak in the suction pipe could also cause the same problems.

My third email that evening suggested that the city workers try closing the valve to pump No. 1 and then operate pump No. 2. If pump No. 2 were to operate similar to No. 1, I suggested to reverse the procedure and close the valve to pump No. 2 and open the valve to pump No. 1 and see if the situation changes. Doing this would reveal if the seal was not seating on either pump. Sometimes with check valve issues of not sealing the pumps may operate but the result is circulation instead of discharging in the force main.

Well, the workers at Concordia had already checked the above suggestions. My only remaining opinion that the line was air-locked. Pigging the line as



This photo shows the sandbar following clean up by the city.

About 1:00 a.m. that morning, I had one more (grasping at straws) thought. What if there was a water main in the area of the sewer force main and a water leak had occurred and a sewer valve was shut off instead of water valve. No, such a situation would not be possible in this case.

What the Concordia staff determined a few days later was that in late 2013 (remember this problem was first recognized in April 2015) a

construction company had bored a 6-inch gas main under the river. Was it possible that the installation of the gas line hit the sewer force main?

Finding the problem

The Concordia staff connected a reduced pressure principle backflow device and meter to a fire hydrant. Because the lift stations pumps were not operating, sewage was being hauled with the city vac truck. The

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the utility superintendent had already commented would remove any air in the line as well as any debris. The city workers planned to use the city's sewer-vac truck to keep ahead of the inflow to the lift station until the problem was resolved.

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Wamego says "No more disposable wipes!"

The city of Wamego recently passed an ordinance to outlaw disposable wipes from being flushed into the city's sewer system. Flushing wipes is now considered a misdemeanor in Wamego and could carry a fine of up to \$500.

On May 5, the city approved the ordinance "prohibiting the discharge of disposable wipes, flushable wipes, baby wipes or similar named products into the public sewers of the city of Wamego.

Mac Campbell, director of operations for Wamego, recently reported that the wipes have caused problems in the Wamego sewer system and elsewhere. The wipes, which do not degrade like toilet paper, grab onto root balls in a sewer line and get soaked with disposed cooking oil which congeals, turning the entire glob into a hard substance.

While it may not be fair to compare Wamego to New York City, the problems are similar. According to a recent article published by Daily Tech, New York City officials comment that the amount of wipes extracted from sewage waste have doubled since 2008, from 50,000 cubic feet per month to present levels of 110,000 cubic feet per month. Annually the removed solid waste totals 40,000 tons and roughly 1.3 billion cubic feet. The waste removed by the city's sewage treatment plants equates to the size of 1,000 subway cars.¹

¹ <http://www.dailytech.com/Stinky+Mess+Wipes+do+18M+in+Damage+to+NYC+Sewers/article37246.htm>



This is an aerial photo taken in the spring of 2014 that captured the 6-foot diameter hole above the force main near Concordia.

workers connected the water supply to the force main and pressurized it to 80 PSI. They had calculated the amount of water needed to fill the force main at 12,000 gallons. They waited at the manhole where the force main discharged into. Nothing appeared. So it was obvious that there was a leak in the force main. Their worst nightmare was becoming apparent; the force main was broken under the Republican River. Sure enough, water that was pressurizing the force main boiled up to the surface on a sandbar. The city crew immediately shut off the water and contacted the Kansas Department of Health and Environment to make the agency aware of the situation. They cleaned up debris from the sand bar, which took the use of manual labor, an all-terrain vehicle and filled two large dump truck loads. They also took samples from the river at several locations and found no significant increase in BOD or E. coli. They hired a contractor to replace the force main under the river and within a couple weeks the new line was in place and operational.

I summarized this case in this article to give just one example of the wide range of issues that a wastewater utility might encounter. The staff at Concordia handled the problem by systematically eliminating all the potential causes for the problem and are commended for their logical approach to trying to identify the problem.

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