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July 29, 2010

Bobby Hall
City of Elwood
PO Box 357
Elwood, KS 66024

Dear Bobby;

As you requested, I conducted the measurements on July 28. I want to thank Dave for his assistance with the sludge profile and to Wayne for providing the permit and lift station information. A report is enclosed.

We took 41 measurements in the Northeast (primary) Cell #1. The average sludge depth in this cell was 10.73 inches. This cell was being operated at a depth of 5.5 feet. The loss of capacity due to sludge accumulation is 16.26%. The depth of heavy sludge is about 6 inches.

40 measurements were taken in Cell #2. The average sludge depth in this cell is 13.3 inches, with at least six inches of heavy sludge. This cell was being operated a depth of 7 feet. Loss of capacity in this cell is 15.83%. Cells should not be operated over a depth of 6 feet as most permits require reporting to KDHE when "free Board" (depth of water level to top of dike) is less than 2 feet. If operated at 6 feet of depth the loss of capacity is 18.47 percent.

We took 23 measurements in Cell #3, the discharging cell. The average sludge depth in this cell was 12.43 inches. A loss of capacity is 14.8 percent at 7 feet operating depth, and would be 17.26% at an operating level of 6 feet.

I do not believe removal is warranted given the limited amount of heavy sludge in the lagoons. Sludge removal is usually only necessary when a system fails to meet discharge permit limits or when the system has constant odor problems. The odors will usually only occur when approximately 25 percent of lagoon capacity is lost due to sludge accumulation. Other factors include system design and capacity. Sludge removal project can be a significant expense and should be budgeted for.

We started the sludge profile on the primary cell and I noticed that water at depth from the sludge judge was very clear. This concerned me as this is an indication of Inflow and Infiltration, commonly called I & I. Usually the color of the water in the primary cell is very consistent. This is why I asked Wayne for the permit and flow information. Your pump station setting from "On" to "Off" is 3.75 feet for a total capacity of approximately 240 cubic feet or 1,795.2 gallons. This amount could be inaccurate due to flow entering the lift station. It would be appropriate to check flows late at night when flow entering the lift station is lowest amount.

Your lift station is operated with both pumps coming on at same time. Most systems alternate pump operation. With both pumps running, I calculated capacity at 598.4 gallons per minute (GPM). This calculation should also be determined for each pump operating alone. Due to pipe size/capacity you cannot always just divide the 598.4 by one-half and use that number for the gallons per minute per pump. Your system is designed for 158,175 gallons per day

(GPD) using the flow information for June, your system averaged 282,923 GPD. This is well above average flow. You may want to make this calculation for each month since you have run times for the pumps.

I used the lagoon design of 11.62 acres and the operating depths of the cells, less 12 inches for sludge accumulation, to determine that the system has approximately 70 days of detention time. KDHE Minimum Standard design is 120 days detention. If the cells were operating at 5 feet, less the 12 inches for sludge or 4 feet, the detention time would be 54 days. If I&I cannot be reduced to allow for the design flow, another cell may need to be added. I calculated an additional 10 acres of cell space would be needed, at 5 feet operating depth to achieve 120 days detention time.

I did not know if your system is meeting the discharge permit limits, but if you are, it is, in my opinion, due more to dilution than that of actual treatment of the waste. You may have noticed that the sludge depth is deeper in the final two cells than in the primary, this is unusual as most systems the sludge is deepest in the primary cell then lesser amounts in each of the following cells. I believe this is due to flow entering the lagoons at such a high volume that the waste cannot be treated and settle out, causing short circuiting which also results for the shorter detention times

I also realize that your system is unique and has a very high water table and prone to flooding, which is most likely the source of I&I. Wayne said several of the individual lift stations were installed in low areas. You have raised these and are checking the other individual lift stations. This may be the largest cause of I&I for your system.

Please call if KRWA can be of any further help or provide additional information.

Sincerely,

Charlie Schwindamann
Wastewater Tech

CS: ejr

Enclosures

C: George Mitchell, Jr. Mayor

Pam King, City Clerk

Vic Montgomery, KDHE, Lawrence

Top is North

Cell # 1

12"	12"	12"	14"	14"	12"	10"	10"	10"	10"	10"
12"	10"	10"	12"	10"		10"	10"	10"	10"	10"
12"	12"	12"	12"	12"		10"	10"	10"	10"	10"

Cell operating depth: 5.5 feet

Average Sludge Depth: 10.73 inches

Sludge Profile

City of Elwood

July 28, 2010

Top is North

Cell #2

14"	14"	14"		16"	12"	14"		12"	12"	14"		14"	14"	
14"	12"	12"	12"	12"	14"	12"	14"	14"	16"	20"	18"	16"	14"	12"
14"	12"	12"	12"	12"	12"	12"		12"	12"	14"	12"	10"	12"	12"

Cell Operating Depth: 7 feet

Average Sludge Depth: 13.3 inches

Top is North

Cell #3

	12"	12"	10"	12"	12"	12"	12"	
	12"	12"	12"	12"	12"	12"	12"	
12"	12"	12"	12"	12"	14"	14"	16"	16"

Cell Operating Depth: 7 feet

Average Sludge Depth: 12.43 inches