CE 432/532 – Design of Water and Wastewater Systems II
Homework Problem – Lagoon Nitrifying Trickling Filter Design

Given the wastewater flow and ammonia-N data provided in the attached figures, design a nitrifying trickling filter to achieve an effluent concentration of 2 mg NH_4-N/L. Address the following:

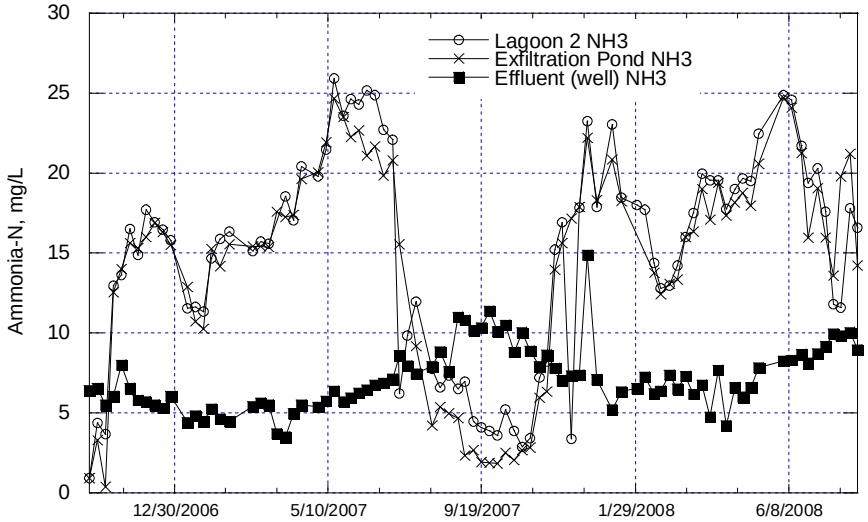
- Design flow rate(s)?
- Design NTF influent NH_4-N concentration(s) and load(s)?
- Tower height, diameter?
- Number of towers?
- Select your media from the following manufacturer: http://www.brentwood-ind.com/water/tricklingfilters.html

- Design effluent NH_4-N concentration?
- Use forced air ventilation – what is your air flow rate?
- Influent pump capacity and pump head?
- Summarize ALL your critical design and operational parameters

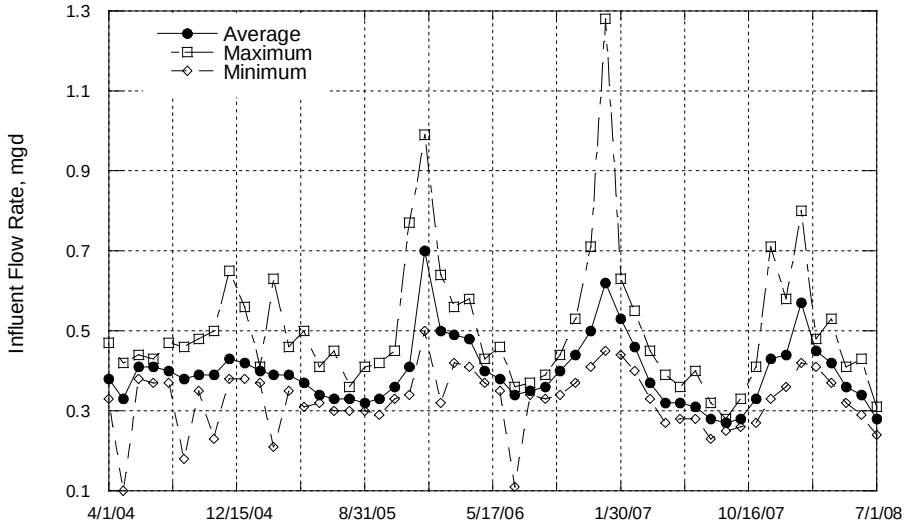
Following is a little more description on the existing WWTF configuration, which will help understand the effluent ammonia-N data. This data is for the Colfax, WA aerated lagoon WWTF, which includes two aerated lagoons operated in series. Aerated lagoons operate similar to facultative lagoons, with the exception that air is introduced – in this case, through submerged diffusers. There is no recycle from the outlet of Lagoon #2 to the inlet to Lagoon #1; the wastewater is only passed through the system once for treatment.

Treated effluent flows from Lagoon #2 to an exfiltration basin, where it infiltrates into the ground and ultimately to the Palouse River. Samples were monitored at the Lagoon #2 outlet, in the exfiltration basin, and in a monitoring well (the City's permitted compliance location). You are required to treat the Lagoon #2 effluent.

As a secondary question, explain why the aerated lagoons do not achieve lower effluent ammonia-N concentrations.



Ammonia-N Profile: Lagoon #2 to Effluent Monitoring Well



Historical Monthly Influent Flow