



WCS

WASTEWATER COMPLIANCE SYSTEMS

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Case Study-Santa Clara Pueblo, NM

Summary: Effluent data after installation of the Bio-Dome™ bioreactors system at Santa Clara confirmed that the system did reduce nitrate, which was oxidized from ammonia. So the Bio-Dome™ bioreactors system can achieve the complete nitrogen removal cycle if correct conditions are provided.

1. Initial problems: In the late 2000s Santa Clara Pueblo, NM found that nitrate levels from its lagoon system were 60 to 100 mg/L. According to the EPA, anything higher than 10 mg/L is considered a potential health problem. Eventually, it was determined that the cause of this increase was excess percolation coming from its lagoons. And although there wasn't an immediate public health threat due to the fact that no one was living downstream from the lagoons, some of that nitrate was nevertheless making its way into the Rio Grande River and surrounding groundwater. Due to this increase, the pueblo needed to enhance the treatment capability of its lagoons and reduce its total nitrogen concentrations, all without spending a large sum of money on a mechanical plant.

2. Solution: Among other upgrade options, a Bio-Dome™ bioreactors system was chosen because it was reliable and the most cost-effective alternative. The community not only saved the money for their lagoon's upgrade by choosing Bio-Dome™ bioreactors as a capital investment, as well as in operations due to the small amount of energy required for the system.

Prior to installation, Santa Clara Pueblo had a two-cell lagoon with HDPE lining (Figure 1). After assessing the pueblo's needs and expectations, WCS recommended subdividing the lagoon's second cell and populating this subsection with 49 Bio-Dome™ bioreactors (Figure 1). The Bio-Dome™ bioreactors were installed to provide year around nitrification and denitrification in the treatment cell. This was to be accomplished by first "nitrifying" the water (i.e., removing the ammonia in the water by turning it into nitrate and nitrite). To do this, air was pumped through the Bio-Dome™ bioreactors for 20 hours each day. When air is flowing to the Bio-Dome™ bioreactors ammonia is consumed and turned into nitrate. As soon as the air is cycled off, the nitrate is converted into nitrogen gas, which escapes out of the water, thereby decreasing the concentration of nitrate in the lagoon.

3. Results: The 49 Bio-Dome™ bioreactors were installed in October 2013. Since that time, the concentration of nitrate has been significantly reduced. Data was gathered during January, April, July, and November of 2014. The concentration of nitrate has been significantly reduced from its high of 100 mg/L in the late 2000s to an average of just 0.85 mg/L (Figure 2). BOD, TSS, nitrite, ammonia, total nitrogen, and TKN have also all seen notable reductions in the lagoon. Even in the winter, Santa Clara Pueblo has experienced significant reductions. The denitrification cycle removed an average of 4.45 mg/L of nitrate per day at 90,000 gallons. In April and July, all of the nitrate produced by the nitrifying process was denitrified

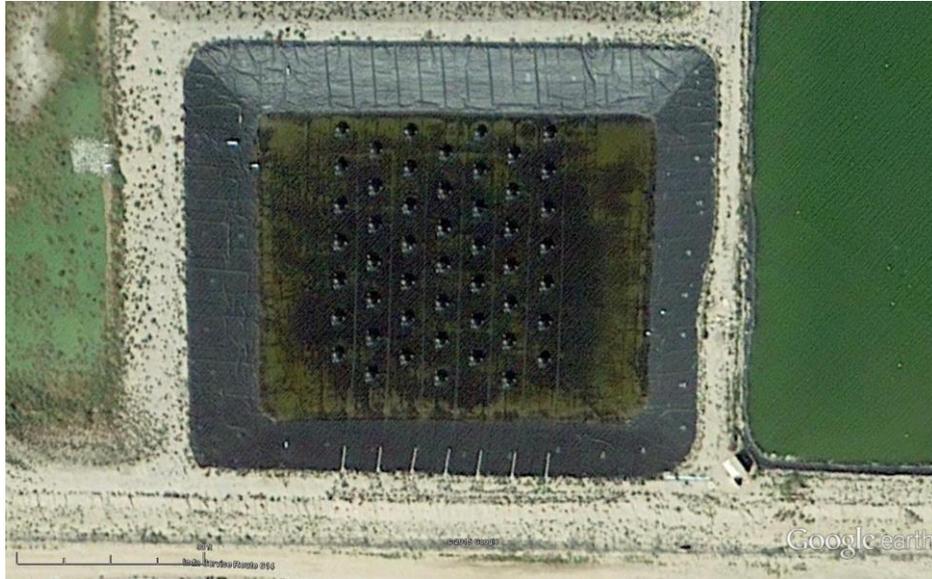


Figure 1: Satellite image of Santa Clara Pueblo wastewater lagoon

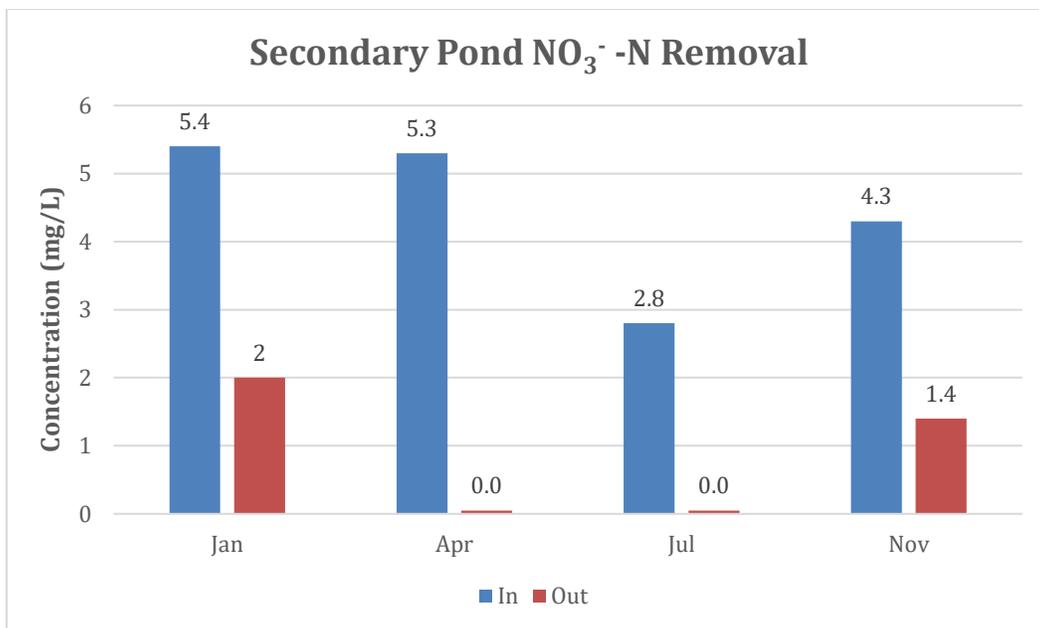


Figure 2: Nitrate Removal

As shown in Figure 3, effective ammonia removal was demonstrated during January, April, July, and November of 2014. Average ammonia removal in the secondary pond was 5.4 mg/L, which at a flowrate of 90,000 gallons per day is approximately 4.1 lb/day. With 49 Bio-Dome™ bioreactors in the water, this equates to around 0.1 lb ammonia removed per Bio-Dome™ bioreactors per day, a rate consistent with the many other locations benefiting from Bio-Dome™ bioreactors in their lagoons.

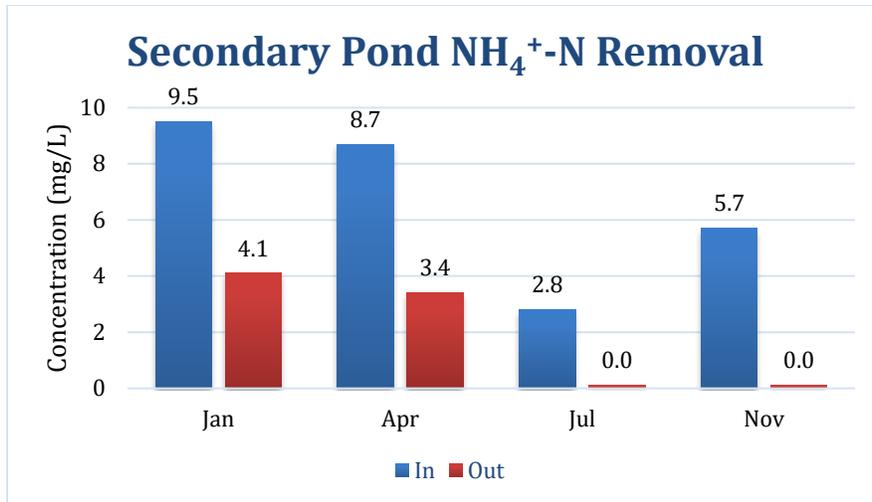


Figure 3: Ammonia Removal

Customer Feedback

Santa Clara Pueblo has been pleased with the performance of the Bio-Dome™ bioreactors since their installation. According to Christen Glime with IHS, “It’s nice as an engineer to actually see a product do what it claims it will do. Nitrate and ammonia levels have dropped considerably and O&M costs—a very important consideration for the tribe—are only about \$3,000 a year.”

Glime was also pleased with the helpfulness of WCS during the sizing and installation process. Glime stated that, “Kraig Johnson and WCS provided a wealth of data to back up their claims while we were considering wastewater treatment options for the pueblo. That information really helped us come to the decision we made.”

Santa Clara Pueblo has a daily flowrate of around 90,000 to 100,000 gallons per day. If that number were doubled, the pueblo would still be able to meet safe nitrate levels with its current levels of Bio-Dome™ bioreactors . As such, they are confident that the Bio-Dome™ bioreactors will be a long-term wastewater treatment solution for their community.