



MEMORANDUM

To: Walter Johnson
From: Don Hearl
Re: Wastewater Treatment Systems and Performance
Date: April 6, 2021

Pursuant to your request, EnviroProcess LLC offers the following comments relating to wastewater treatment systems and expected performance of the system proposed for Timber Shores. To establish my credibility as a technical consultant relating to this project, I have worked in the water and wastewater treatment field for fifty years. During this time, I have had some level of involvement with more than six hundred water and wastewater treatment systems. Treatment systems ranged in size from two-thousand to eight million gallons per day. In addition to process consulting, I teach wastewater treatment courses, including classes sponsored by Virginia Polytechnic Institute and State University.

Based on our discussions I understand that the planned development will include an onsite wastewater treatment system capable of producing a high quality effluent suitable for subsurface discharge. Subsurface discharge permits typically include fairly stringent requirements for removal of contaminants prior to discharge. These contaminants will likely include Total Nitrogen, Fecal Coliform bacteria, and Phosphorus. A Total Nitrogen concentration limit includes Nitrate as a component of Total Nitrogen. Excess Nitrate can lead to health issues, thus when selecting a treatment process, it will include the capability for conversion of Nitrate, and reduction of Total Nitrogen to near limits of technology.

Many treatment systems have the capability to produce a high-quality discharge with extremely low contaminant's level. The majority of commercial systems use an activated sludge, biological treatment process. Biological activated sludge treatment is a proven process with decades of performance history. Activated sludge systems are very stable and relatively easy to operate. In the rare chance that a process upset does occur, the biomass recovers quickly, with minimal change in discharge water quality. I have reviewed the proposed treatment system for Timber Shores and it contains the technology necessary for producing a high-quality discharge. The moving bed bio-reactor (MBBR) utilizes a unique fixed film substrate suspension system that enhances the basic activated sludge process. Following the biological reactors is a settling/clarification basin to remove particulate. Each of these processes is equipped with redundancy, thus in the event a treatment component should fail, a backup is readily available. A flow equalization basin will be sized to hold incoming flow in the event of a process upset or excess flow.

Based on my experience, I have seen adverse groundwater impacts from poorly maintained treatment systems. The most common issues were elevated Nitrate and

Fecal Coliform bacteria concentrations. Poor discharge quality can occur with any type of treatment system, regardless of the sophistication, if it is poorly maintained or improperly operated. In most cases groundwater contamination was caused by leaking unlined wastewater treatment ponds. This issue has largely been addressed by improving overall treatment systems reliability and level of process monitoring. Another factor having a direct impact on groundwater contamination is that there are fewer treatment ponds in use today than thirty years ago. The ponds that are in use today tend to be lined, thus preventing groundwater contact. The proposed treatment system has the capability of producing a much higher water quality than the typical treatment pond.

Treatment systems are classified according to flow capacity and level of process sophistication. This system classification dictates the level of licensure that is required by the operator. As with any well operated wastewater treatment system, the Timber Shores facility will employ a qualified operator. Only licensed operators may oversee treatment system process control and water quality testing. The proposed MBBR process utilizes advanced treatment processes to remove Nitrogen and Phosphorus, thus the operator skill level will meet these requirements. In addition to operator skill and qualifications, the treatment system will be equipped with remote process monitoring instrumentation designed to alert the operator if a process upset occurs. This early warning capability allows the operator time to respond and implement process adjustments or place back-up equipment on line to avoid a major system upset. The combination of a highly qualified licensed operator and remote monitoring capabilities will help ensure that the Timber Shores treatment system will operate trouble free and reliably produce a very high-quality water.

A report has been circulated that contains skewed information relating to the projected wastewater volume and associated nutrient loading impact on groundwater. In one instance a projected discharge volume was calculated using a toilet flush volume of 2.2 gallons per flush. This volume relates to mostly obsolete higher flush volume toilets and skews the actual quantity of nitrogen and phosphorus that will be discharged. The typical low volume toilet used today in both RV's and homes produce less than one half the volume used in the noted calculation. Although there is nitrogen and phosphorus discharged in all treated wastewater, the impact on groundwater in this case will be very low. The treatment technology proposed will produce water quality many times better than a residential septic system. Additionally, any system proposed will be required to meet stringent regulatory standards for water quality, including nitrogen and phosphorus. These regulatory requirements are designed to ensure that the water discharged will not have a degrading impact on groundwater.

Based on the type of system proposed I am confident that with proper operation the water discharged will not adversely impact groundwater. Regulatory permit required monitoring provides interested parties with the visibility of system performance.