
**WHITE OAK COUNTRY ESTATES
WASTEWATER TREATMENT FACILITY
HAMILTON TOWNSHIP, MONROE COUNTY**

WQM 20170809



WASTEWATER TREATMENT EVALUATION

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Disclaimers:

This report is meant to share findings and suggestions from DEP staff. It should not replace the advice of licensed engineers. Any brand names mentioned are only examples, not endorsements. The goal of DEP's Wastewater Optimization Program is to improve water quality by helping facilities with training, monitoring, and troubleshooting.

EXECUTIVE SUMMARY:

At the recommendation of U.S. Environmental Protection Agency water management staff (EPA), Pennsylvania Department of Environmental Protection wastewater technical assistance staff (DEP) worked with Portland Contractors, Inc., the operator of the White Oak Country Estates STP in Monroe County, to improve effluent quality at the owners' wastewater treatment facility. In 2022, EPA staff had borrowed an Oxidation/Reduction Potential (ORP) and dissolved oxygen (DO) probes from DEP's wastewater technical assistance program (WWTAP) to provide insight into ongoing treatment inefficiencies in denitrification of treated ammonium waste. Using only ORP and DO probes proved ineffective, so WWTAP staff proposed deploying a full set of monitoring equipment at the site while Portland staff would be making process adjustments. Field work began in mid-January and concluded in late-March 2023, after which reduced monitoring continued while awaiting further improvements. The chief purpose of the technical assistance was to optimize biological nitrate reduction to meet or better the effluent discharge limit of ten milligrams per liter for groundwater discharges.

Technical assistance by DEP WWTAP staff was conducted throughout the duration of this project, resulting in no definitive answers as to why this facility could not achieve the desired results. The overall issue observed was that anoxic conditions could not be achieved where necessary. In 2024, the operator for White Oak discovered the programming for the controller of the DO probe in the aeration tank was not programmed correctly which controlled the VFD blowers in the aeration tank. The DO probe controller was re-programmed by the manufacturer to properly control the VFD blowers for the aeration tank. The result of this reprogramming brought plant back into compliance.

Although the efforts of the DEP WWTAP did not yield expected results, it is important to note the efforts made and the willingness of the operator to work with WWTPA staff. This report summarizes those efforts even though they were unsuccessful.

Wastewater Treatment Evaluation - Background

PA DEP's Wastewater Operations Treatment Advisor, evaluated treatment plant performance at the request of Craig LaBarre, the contract operator, in 2021. His summary report dated November 19, 2021, suggested using an oxidation / reduction potential (ORP) probe to monitor anoxic activity in one of the treatment units. Around the beginning of March 2022, Walter Higgins of EPA Region 3 outreach program asked DEP's WWTAP to borrow an ORP probe and sc200 probe controller to use at the White Oak plant. DEP staff installed the probe as requested, and EPA staff cared for the probe and downloaded data that was shared with DEP.

Conditions showed that the anoxic zone tank would rapidly become anaerobic. During this time, the plant operator began adjusting the treatment process to favor denitrification, but the remedies were short-lived. DEP staff at the time thought that the facility required some rearrangement of plumbing to bring influent wastewater and internal modified Ludzack Ettinger recycle (IMLER) flows together so that denitrifying bacteria could benefit from organic carbon in the wastewater.

Tests using portable dissolved oxygen probes demonstrated that the anoxic tank was not uniformly anoxic. It was thought that the open-air drop from air-lift pump discharges created splashing and reaeration of mixed liquor, such that the denitrifying bacteria at the surface had oxygen available for metabolism, avoiding the bound oxygen found in nitrite and nitrate.

A project brief by DEP and EPA in March 2022 suspected mixing problems at the anoxic tank but discovered that mixing appeared to be adequate after repositioning the ORP probe higher in the tank while yielding similar data results to those where the probe had been positioned deeper. Process adjustments recommended to the operator included running both IMLER pumps and the anoxic mixer while continuing to monitor ORP. Total nitrogen reductions were scattered during March, when there

were several electrical outages at the plant, but in April, the facility operated within permit limits without recurring problems.

After a time, though, the facility's sludge quality began to decline. DEP's Treatment Advisor suggested that a full-scale wastewater treatment evaluation be performed to identify the root causes of continual plant upsets.

Beginning in Jan 2023, DEP staff from the wastewater treatment optimization program deployed several probes to the facility, including dissolved oxygen, pH, ORP, suspended solids, nitrate, and ammonia-nitrogen. Two nitrate probes were deployed: one in the anoxic tank and another in the supernatant of the secondary clarifier. Use of these probes was supplemented by weekly process monitoring tests for settleability, suspended solids by volume, microscopy, oxygen uptake rate, colorimetry, and spectroscopy tests for wastewater strength and for nutrients, including phosphorus, ammonium, nitrite, and nitrate. During the WTE, DEP staff also recommended adding sugar as an organic carbon source to the anoxic zone to provide extra fuel for denitrifying bacteria.

The evaluation ran until late April 2023. Some modifications made by the facility operator included:

- Modification of the return activated sludge (RAS) and internal MLE recycle (IMLER) discharges to reduce splashing and mixing of air into the anoxic zone
- Replacement of a broken electrical switch that was interfering with process control.
- Addition of sugar water, although this did not produce benefit because the discharge tube at the anoxic tank was considered too far from the mixing of IMLER with wastewater to be of benefit.

Of its own, the facility would revert from compliance to non-compliance and back, without a definitive cause being determined. As time went on, DEP staff began to consider that the operational difficulties required an engineering solution that would reconfigure the treatment plant because all other efforts were not achieving desired results.

Following withdrawal of most WTE equipment, DEP staff left installed one nitrate probe and one dissolved oxygen probe for continued monitoring until June 28, 2023. DEP staff visited the site to maintain its equipment and download data every week during that time, providing graphical interpretations of the data to the interested parties.

After the WTE, the facility saw some minor improvements in process, and DEP continued working with the operator to see if inexpensive alterations might improve things. Several recommendations were discussed during the course of the extended technical assistance in 2022 and 2023. However, in 2024 operator Mr. LaBarre had discovered the programming of DO probe in the aeration tank that controlled the VFD blower was not properly configured and had significantly impacted plant performance throughout the entire evaluation. After having the DO probe reprogrammed the plant started performing within compliance.

Acknowledgements:

WWTAP staff thank the White Oak Estates community and Portland Contractors for the opportunity to conduct its Wastewater Treatment Evaluation at the community's wastewater treatment facility, and they are grateful for the participation of EPA Region 3's Office of Infrastructure and Assistance during the preliminary phases of DEP's outreach assistance to this facility.

ATTACHMENT A: EVALUATION TEAM***PA Department of Environmental Protection***

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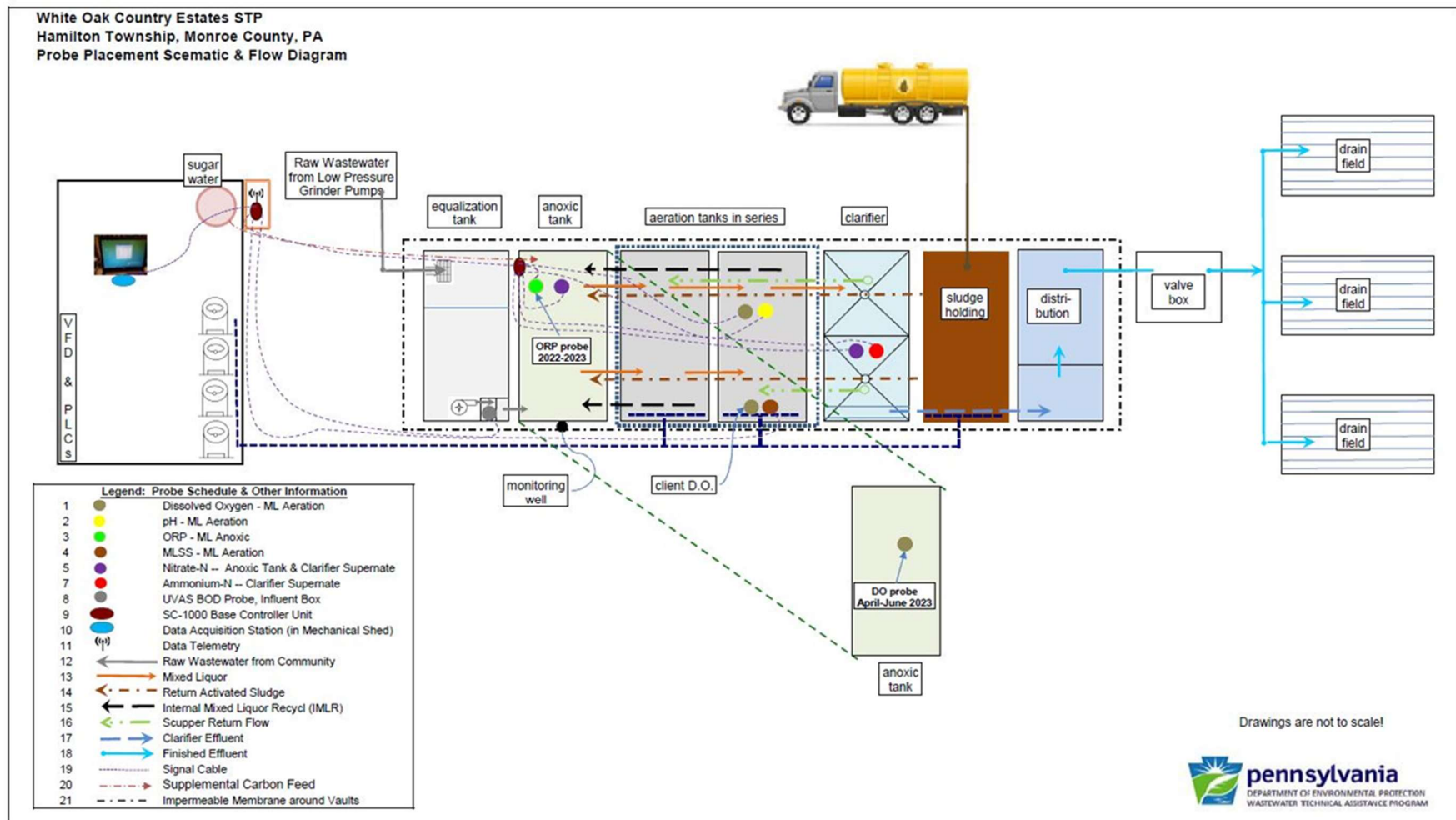
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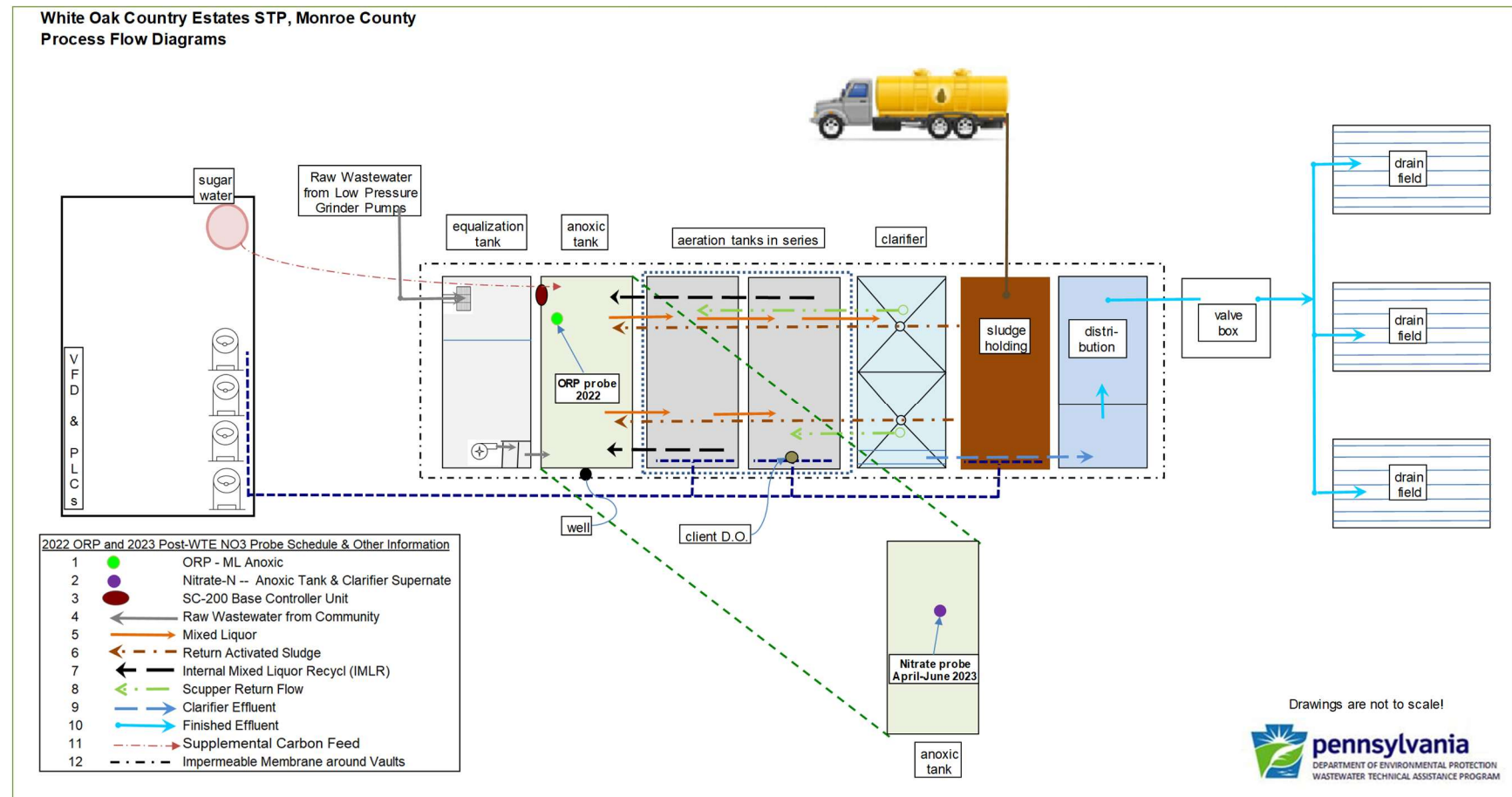
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ATTACHMENT B: PROCESS & PROBE SCHEMATIC

This diagram shows probe placement during 2023 Wastewater Treatment Evaluation (WTE).



This diagram shows ORP probe placement in 2022, prior to the WTE, and the Nitrate probe placement post-WTE in 2023.

ATTACHMENT C: RECORD PHOTOGRAPHS



View of Plant & 3 Drain Fields



Wastewater Treatment Facility



Drain Field



D.O. Probe & Controller for aeration VFD



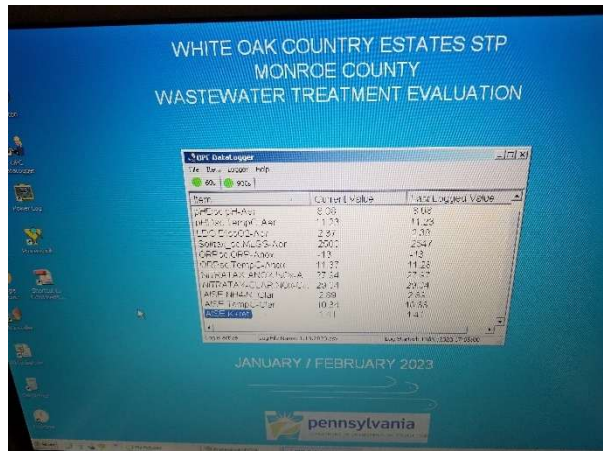
Rotary Lobe air compressors



Control Panel & VFDs



WTE Portable Lab & Datalogger



Data Logger Screen displays current values



UVAS probe at splitter box



Rags collect on sensor probes



Rags collect on YSI dissolved O2 probe



Modified recycle discharge



Post-WTE nitrate & D.O. probe at anoxic tank



Settled sludge at 30-minutes



Supplemental carbon day tank