Lancaster County Water and Sewer District
Indian Land WWTP
Odor Abatement Plan

Overview

The Lancaster County Water and Sewer District (LCWSD) Indian Land Waste Water Treatment Plant and collection system (collectively, ILWWTP) utilize multiple odor abatement Best Management Practices to minimize undesirable levels of odor. While the SC DHEC issued permit to manage the collection and treatment system addresses only having a plan for sludge facilities, this Plan takes a proactive approach to the entire system (collection and treatment).

Our primary mission in managing wastewater from residential and commercial sources is to protect public health and the environment by properly transporting wastewater flows consistent with standard engineering practices to a modern treatment plant. This treatment plant (new and proposed expansion) has been approved by SC DHEC and is designed to protect the Catawba River by providing a high level of treatment. The treated wastewater effluent meets SC DHEC standards for protecting the river and our operations staff maintain the treatment system in accordance with industry practices.

The Water Environment Federation (WEF) notes, in their fact sheet titled "*Liquid Stream Fundamentals: Odor Management and Control*," that "odor emissions from a WWTP are nearly impossible to prevent." As a result, management strategies are put in place by wastewater operations to mitigate the impacts of odor emissions on surrounding communities.

The Odor Abatement Plan detailed below includes the following topics:

(1) Operation and maintenance practices, which are used to minimize undesirable odor levels in the form of best management practices for Odor Control;
(2) The use of treatment processes for the reduction of undesirable odors;
(3) The use of setbacks; and
(4) Contingency plans and methods to address odor problems for the different types of collection system complaints and sludge disposal/application methods used.

In addition, transportation and disposal of ILWWTP sludge occurs pursuant to a contract performed by Synagro. Disposal includes a combination of land application and landfilling. Synagro maintains its standard operation procedures in a separate document identified as "*Lancaster County Water & Sewer District, South Carolina, Odor Control Plan for SC DHEC NPDES Permit #SC0047864*." This Synagro Plan forms a component to satisfy SC DHEC's permit requirement for sludge management activities.

Operation and Maintenance Practices

The ILWWTP utilizes the following operations and maintenance Best Management Practices:

1) Good Housekeeping: This includes, but is not limited to, keeping areas around the headworks (screening and grit) hoppers clean and periodically washed down, ensuring the drain from the pad is not clogged, keeping other areas monitored, and not allowing material to accumulate outside designated containers.

2) Grit and Screenings: The hoppers used to collect the grit and screenings from the headworks are emptied at a minimum every other day and at least once over the course of a weekend. As material accumulates in the hoppers, LCWSD staff periodically distributes several scoops of hydrated lime over the collected material. When the hoppers require removal, they are transported to a 10-yard roll-off container.

Use of a bagging system for the material is being evaluated to enhance this practice. Bagging system reliability has been an issue in the past and resulted in the current practice, which is more manageable from an operations and maintenance standpoint.

3) 10-Yard Roll-Off: This container is used to hold the grit and screenings from the headworks hoppers and allow the material to be hauled to the landfill. The size of this container has been reduced from 20 cubic yards to improve this practice.

Roll-off containers are typically hauled to the landfill on a monthly basis and more often as needed. Upon return of the container, LCWSD staff places a new plastic liner in the container to avoid seepage of wet grit and water. Once the hoppers are emptied, lime is distributed across the material and the container is covered with a tarp. The container is stored on a concrete pad that is washed down periodically and on an as-needed basis.

4) Clarifiers: The clarifiers are periodically washed down for operations and maintenance purposes. If not maintained, algae will accumulate in the discharge trough and grease will bind with other material that floats. These accumulations can cause odors.

5) Containment: LCWSD staff has installed rubber mats over the grating at the headworks screen and grit separator. This containment assists in retaining off-gassing odors at the headworks area.

LCWSD also utilizes Evoqua Water Technologies Full-Service Odor Control (FSOC) program to assist with odor and corrosion control in the collection system while wastewater is conveyed to the ILWWTP.

The FSOC program is designed to continuously monitor for odors, primarily hydrogen sulfide (H2S), within the dynamic wastewater collection system. The goals of this program are to prevent the generation and/or release of odorous compounds into the atmosphere and to help control corrosion of the collection system components. The letter

included in Appendix 1 details the FSOC program and how it utilizes multiple chemicals, monitors, and communication systems to achieve the goals.

Use of Treatment Processes

Treatment process best management practices at the ILWWTP are utilized to reduce undesirable odors. This is achieved by maintaining proper dissolved oxygen levels in the extended aeration process and the aerobic sludge digestion process.

General operational initiatives are recommended and implemented to control odors. They include:

- Achieving proper aeration rates in biological treatment processes;
- Minimizing solids inventory and sludge backlog;
- Reducing overloading of plant processes;
- Reducing the potential for free-fall turbulence within the plant process;
- Increasing the frequency of disposal of grit and screenings; and
- More frequent cleaning of odorous accumulations.

Maintaining proper mixing within and periodic removal of any settled material from the equalization basin also aid in the reduction of odors.

Current Process: The current method of treatment is a conventional activated sludge process, which is common across the utility industry. This particular system is designed with aeration and clarification conducted by ring steel vessels with the aeration chambers on the outside perimeter and clarification on the inside of the tank. This activated sludge process is aided with fine bubble diffusion at a rate of 10 scfm/1000 cf.

Sludge generated is recycled by means of an airlift at an adjustable rate to maintain a Mean Cell Residence Time (MCRT) of 15 days. Sludge is wasted to the digester through telescoping valves. The aerobic digester consists of fine bubble diffusion aeration provided at a rate of 30 scfm/1000 cf of tank volume. ILWWTP also includes tertiary filtration and UV disinfection processes which both emanate negligible odor.

Proposed Process: A Sanitaire ICEAS SBR (Intermittent Cycle Extended Aeration System Sequence Batch Reactor) is proposed for the current plant expansion and upgrade to 5 MGD. This continuous flow biological treatment system brings together process, aeration, decanting and control in a single treatment tank and will replace the prior conventional system. It will also allow for higher quality effluent to protect the Catawba River.

The process is fully automated and includes a completely integrated design consisting of the aeration system, blowers, pumps, mixers, effluent decanters, monitoring and control equipment and comprehensive process control system. Unlike the current conventional activated sludge plant, there is no need for primary or secondary settlement tanks or return sludge pumps. All treatment is done in a single basin. The process design requirements include a Mean Cell Residence Time (MCRT) of 28 days and the ICEAS process is aided with fine bubble diffusion aeration at a rate of 10 scfm/1000 cf. Aeration

will be provided in the sludge aerobic digester at a rate of 30 scfm / 1000 cf of tank volume.

Screening, tertiary filtration, and UV disinfection will all be similar to current processes. A centrifuge will be added to assist with dewatering of sludge on-site in order to reduce future hauling and disposal costs when sludge is landfilled. One of the key advantages to aerobic sludge digestion is the production of an odorless, humus-like, biologically stable end product. *(Wastewater Engineering – Treatment, Disposal, Reuse; Metcalf & Eddy Third Edition; Chapter 12-9.)* This highly treated sludge end product is recognized by the U.S. Environmental Protection Agency (EPA) since it has beneficial uses as a soil amendment and fertilizer supplement for farming operations and other uses. The EPA refers to the byproduct as "biosolids" because of its potential to be recycled productively.

Additional Measures: Most odor problems occur in the collection system where long detention times, changing demands and infrastructure, and continuously fluctuating dynamics can make the most effective odor control systems inconsistently effective.

In an effort to provide a "belt-and-suspenders" approach to its current full-service odor control (FSOC) program within its collection system, LCWSD is currently constructing a combined influent box at the treatment plant site to consolidate the location of all influent flows to a single chamber where these variable wastewater flows can, if necessary, be chemically treated and contained with carbon media odor scrubbers to minimize odors prior to entering the screening, weirs, and varying treatment processes within the facility. These improvements are captured in Appendix 1 with the addition of chemical feed systems to a proposed influent box. This box will allow all influent waste streams to be chemically treated earlier in the treatment process and these improvements are expected to be completed by early 2022 along with the project to expand and upgrade the treatment system technology.

Use of Setbacks

In cases where treatment facilities are close to developed areas, buffer zones are effective in isolating odors from development. An example of buffer distances used by New York State is presented below and incorporated visually in the Odor Containment Buffer drawing represented in Appendix 2.

Table B-1 Recommended Minimum Aerial Separation Distance (in feet) from Treatment Facility

Treatment Type	Radial Distance to Existing Downwind Dwellings (On or Off the Property)	Distance to Property Line from Treatment Unit
Wastewater Treatment Processes Open to the Atmosphere (e.g. Oxidation Ditches)	400 feet	350 feet

Source: New York State Department of Environmental Conservation

In general, these recommendations apply to human habitation (i.e., residential dwellings), public use, and gathering areas. There are no similar recommendations or rules set by SC DHEC or other state law or local ordinance. The distance buffer shown in Appendix 2 has been approximated to 500 feet +/- to account for meteorological variables, type and location of adjacent development; and a margin of additional measure.

Contingency Plans

Knowing that odor emissions from a WWTP are nearly impossible to prevent makes it important to have a dynamic plan and contingency tools for temporary conditions. LCWSD gathers and charts customer feedback, installs short term odor loggers to evaluate site specific conditions, and utilizes site specific carbon manhole odor scrubbers in conjunction with the FSOC collection system program from Evoqua. Evoqua is a contractor specializing in this line of work.

Understanding how odors can be transported by wind along with factors such as topography, meteorological conditions and odor source characteristics can be a difficult task, as is common in all wastewater utility systems LCWSD takes a direct approach to what can be a complex evaluation. Customer feedback is gathered through the Odor Information Summary form shown in Appendix 3. This form is available to the community on the LCWSD website.

The detailed information requested can assist LCWSD staff with investigating and troubleshooting the collection system components and WWTP processes. Data provided by the community and LCWSD staff is tabulated in a spreadsheet and charted for review of trends in wind conditions, strength of odor, and any special conditions such as problems in the collection system or noticeable odor contributors beyond the ILWWTP. Although complaints tend to be wide-ranging with respect to occurences; the data we have collected trends towards the highest customer feedback during early evening hours in the fall of the year with quiescent meteorological conditions.

Odor loggers are utilized for evaluating site specific hydrogen sulfide conditions on an interim basis. Evoqua installs and maintains these instruments to measure hydrogen sulfide as part of the FSOC program. Hydrogen sulfide is monitored as it is the most prevalent odor causing compound in wastewater.

Odor loggers were installed for various periods between October of 2019 and March of 2020 at the ILWWTP headworks/equalization basin area, aeration basins, sludge holding tank, and nearby residential areas. One reading was recorded at a higher-than-normal level at the top of the sludge holding tank during sludge removal operations. The remaining sites and readings registered no problems with hydrogen sulfide.

Carbon media odor scrubbers have been utilized to address site specific issues for manholes within the collection system. These scrubbers are generally a temporary measure to address the vapor phase issue while system operations and maintenance items

or chemical feed changes are addressed. The information below details some of the key features of this measure.

Figure: Manhole Scrubber

Two odor control chemicals, advanced dosing controllers, and remote monitoring units are utilized in the Evoqua FSOC program. A line drawing identifying the collection system infrastructure and Evoqua chemical feed locations, dosing systems, and monitoring systems is included in Appendix 1. Bioxide®, a removal and prevention treatment chemical, is fed at five pump stations near the extents of the system while Odophos®, a removal treatment chemical, is fed at one site closer to the WWTP.

Three of the Bioxide® feed systems utilize the VersaDose LT® (VDLT) advanced dosing controllers. The VDLT system can feed the chemical at various speeds rather than a fixed speed, allowing for more flexibility in liquid-phase treatment. The VDLT's also allow Evoqua to adjust the dosing at the VDLT sites from any web-enabled device using our Link2Site® website. All of the sites are monitored via the website for alarms, chemical tank levels, and/or hydrogen sulfide readings. Appendix 4 shows a screenshot from the website.

Additionally, Evoqua has deployed three VaporLink® H2S monitors in strategic areas of the collection system. These monitors utilize a cellular network to allow Evoqua to understand the hydrogen sulfide levels at each site with near-instant display on the website. Using both the VDLT and the VaporLink® technology incorporates both a modern and proactive treatment method.

A final contingency plan being implemented includes a new influent junction box ahead of the screens at the ILWWTP. This box will allow influent flows to be consolidated and feed chemicals earlier in the treatment process. The use of pH shift technology to control atmospheric and dissolved sulfide in the wastewater treatment system is being evaluated as part of this contingency item. This consolidated location would help implement a vapor phase treatment (odor scrubber) if needed on an interim or permanent basis.

The ILWWTP superintendent, collection system sewer superintendent and LCWSD engineering personnel review this Odor Abatement Plan on a continual basis to determine

if there are program improvements and/or adjustments needed. We also train staff as to the importance of this program.

The program's design, level of resources, and implementation are assessed by these staff members and LCWSD management to determine the adequacy of the program. The goals of this program are to: ensure undesirable levels of odor do not exist, reduce customer complaints, and reduce deterioration of the sanitary sewer infrastructure.