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Incorporated 1887

SANITARY SEWER ANNUAL COMPLIANCE REPORT FOR 2019

General Information Wastewater Treatment Facility

Town of Kenly Regional Wastewater Treatment Facility (Kenly WWTF) is located at 201 Truck Stop Road (SR 2399), near its intersection with U.S. Hwy. 301. The facility is operated under NPDES Permit No. NC0064891, and receives wastewater from the Town of Kenly, Kenly Industrial Park, and the Town of Micro.

The treatment facility consists of the following components:

- Influent mechanical screen: Prevents inorganic material such as rags, twigs, rocks, toys, silverware, or other Inorganic material that will not breakdown during the treatment process and could be harmful to other mechanical devices such as pumps.
- Dual train Envirex Orbal® Aeration System, with disc aerators and propeller mixers: Much of the biological treatment plant occurs in these basins. The units consist of a horizontal disc aeration system with drive motors, propeller mixers, nitrate recycle pumps, valves, and piping. At wastewater treatment facilities, aeration is used to introduce air into the wastewater to create an environment that promotes the growth of microorganisms to decompose the organic waste. The oxygen feeds or nourishes microorganisms within the basin, so the bacteria thrive and consume suspended particulates. This process is referred to as **Nitrification**.

De-nitrification occurs under anaerobic conditions (in the absence of oxygen) and involves the biological reduction of nitrate to nitric oxide, nitrous oxide, and nitrogen gas, which is released to the atmosphere. De-nitrification can be accomplished by heterotrophic bacteria in the absence of dissolved oxygen. These bacteria use the oxygen in the nitrate instead of dissolved oxygen to digest organic material, thereby releasing nitrogen gas as a waste by-product. For treatment facilities to achieve optimum biological nitrogen removal, it is important to process wastewater through a series of aerobic and anaerobic stages, to ensure complete Nitrification and de-nitrification is achieved. Careful monitoring and control of the amount of Dissolved Oxygen (DO) in both the aeration and anaerobic zones and the rate of nitrate recycle is essential to ensure that the Biological Nutrient Removal (BNR) is achieved. The process in Kenly is referred to as a three-stage system to remove Total Nitrogen (TN). Phosphorus (P) is removed from the wastewater stream employing a coagulant such as Ferric Chloride, which binds to the solids, which is then referred to as floc. The heavier floc containing Phosphorus settles to the bottom, where it will eventually make its way to the digester for disposal.

- Flow Distribution Box: The structure utilizes concrete baffles and adjustable weirs to evenly distribute flow from the Aeration Basin to the three circular clarifiers.
- Clarifiers: The Kenly treatment facility consists of three circular clarifiers. These units accept wastewater from the aeration basins, where the heavy solids collect at the bottom of the unit, which allows the clean water (clarifier effluent) to exit this basin over a weir and effluent trough

where it is collected and conveys the wastewater to the filters. The sludge which collects on the bottom of the clarifier or referred to as Return Activated Sludge (RAS). The RAS is recycled to the aeration basins where it mixes with the influent wastewater. The activated sludge process uses microorganisms to feed on organic contaminants in wastewater, producing a high-quality effluent. The basic principle behind all activated sludge processes is that as microorganisms grow, they form particles that clump together.

- Return Activated Sludge/Waste Activated Sludge (RAS/WAS) Pump Station. The pump station is utilized to pump the return activated sludge to the aeration basins for the growth of the microorganisms from the clarifiers, as stated above. Once the sludge reaches a point where the microorganisms are no longer useful to support the biological treatment in the aeration basin, the sludge is wasted to a digester for later disposal.
- Traveling Bridge Tertiary Filters: Effluent from the clarifiers flows by gravity to the effluent filters. The wastewater covers the top of the sand media, which allows the filtration of solids, which are generally sent back through the treatment facility for further treatment. Periodically the filter media needs to be cleaned of the solids, which can accumulate over time. The traveling bridge filter accomplishes this goal, by backwashing two cells at a time and conveying the backwash waste to the digester for disposal. The system in Kenly allows the other filter cells to remain in service during the individual cell backwash.
- Ultra-violet (UV) Disinfection: The Kenly treatment facility utilizes UV to kill pathogens and other harmful organisms from the effluent wastewater. The effluent wastewater flows through a series of UV lights where ultraviolet light kills microorganisms by damaging the DNA. UV radiation disrupts the chemical bonds that hold the atoms of DNA together in the microorganism. If the damage is severe enough, the bacteria cannot repair the damage to reproduce and will die.
- Post Aeration: To provide additional dissolved oxygen to the effluent wastewater before its discharge to the Little River, near the U.S. Hwy. 301 bridge. A manhole installed on the effluent outfall has a series of staggered plates, which will cause the water to splash as it travels downward. This splashing imparts oxygen into the effluent waste.
- Biosolids Disposal: The biosolids (sludge) which are removed from the wastewater during the process, and conveyed to the aerobic digester. The sludge is slightly thickened in the digester by utilizing a combination of cutting a floating aerator on and off, and withdrawing the clear liquid at the top while the aerator is off. The sludge/biosolids are pumped into a tanker truck periodically and hauled to a permitted site to be land applied.

The Town of Kenly, through its NPDES permit measures and reports daily effluent characteristics to NCDEQ each month via a DMR. The NCDEQ monitors and regulates the performance of treatment facilities, which hold an NPDES permit on behalf of the EPA. Effluent limits for the various characteristics are set by NCDEQ based upon the existing water quality of the receiving stream, pollutant monitoring, technology available, and other parameters based upon the characteristic being measured and reported.

The Town of Kenly is also one of 27 member facilities of the Lower Neuse Basin Association/Neuse River Compliance Association (LNBA/NRCA). Each member holds an NPDES permit and discharges into the Neuse River Basin. However, the NRCA holds, and NPDES permit for Total Nitrogen (TN) to control the amount of TN reaching the Neuse River Estuary at the mouth of the Neuse River. The NRCA self regulates its members for compliance with respect to TN provide the group as a whole does not exceed the Total Mass Daily Load (TMDL) in pounds to the estuary. The membership of this group generally includes dischargers such as Durham, Hillsborough, and South Granville Water & Sewer Authority north of Falls Lake to the City of New Bern and Cherry Point Marine Corps Air Station near Havelock which is closest to the estuary. Each facility is allocated pounds of nitrogen-based upon a mass-based limit in pounds per year. The Town of Kenly is allocated 7,096 pounds per year, as

expressed in NPDES permit No. NCC000001. The following table is a list of the Town's effluent characteristics, effluent Limitations, average and maximum concentrations, flow, or other measured parameters as appropriate.

Effluent Characteristics	Effluent Concentrations		Measured Concentrations	
	Monthly Average Limits	Weekly Average Limits	Average Concentration 2019	Maximum Concentration 2019
Flow	0.630 MGD		0.405 MGD	1.26 MGD
BOD 5-day April 1 – October. 31	5.0 mg/L	7.50 mg/L	1.36 mg/L	13.00 mg/L
BOD 5-day November 1 – March. 31	10.0 mg/L	15.0 mg/L	2.91 mg/L	2.096 mg/L
Total Suspended Solids	30.0 mg/L	45.0 mg/L	1.68 mg/L	5.85 mg/L
NH ₃ as N (Ammonia) April 1 – October 31	2.0 mg/L	6.0 mg/L	0.43 mg/L	14.00 mg/L
NH ₃ as N (Ammonia) November 1 – March 31	4.0 mg/L	12.0 mg/L	1.05 mg/L	4.07 mg/L
Fecal Coliform	200/100/mL	400/100/mL	125.74/100/mL	9,800.00/100/mL
TN Load	7,096 lbs./year*		6.44 mg/L	14.14 mg/L
Total Phosphorus	2.0 mg/L Quarterly Avg.		4.88 mg/L	8.73 mg/L

Total TN 7,669 lbs./year = 573 pounds overage

Based on the current flow, the facility is at 64.4 % of its hydraulic Capacity

Abbreviations:	MGD	Million Gallons per Day
	GPD	Gallons per Day
	GPM	Gallons per Minute
	mg/L	Milligrams per Litter
	mL/mo.	Milliliters per 100-Milliliters
	TMDL	Total Maximum Daily Load
	NPDES	National Pollutant Discharge Elimination System
	LNBA	Lower Neuse Basin Association
	NRCA	Neuse River Compliance Association
	BOD	Biological Oxygen Demand
	TSS	Total Suspended Solids
	TN	Total Nitrogen
	NOV	Notice of Violation
	NCDEQ	North Carolina Department of Environmental Quality

Summary of Performance:

Sanitary Sewer Overflows at WWTP: 0

Assessments 1 for exceeding the annual nitrogen allocation by 573 pounds

Notice of Violation 7 Primarily due to Fecal Coliform Violations

General Information Sanitary Sewer Collection System

The Town of Kenly operates a Sanitary Sewer Collection System permitted by NCDEQ number: WQCS00173. The Town operates and maintains approximately 2.5-miles of gravity sewer and associated manholes. 2.8-miles of force mains with nine pumping stations.

Each pump station is equipped with a standby diesel generator and automatic transfer switch for emergency back up power, or a plug-in electrical connection and manual transfer switch and plug (receptacle) which allows the portable trailer mounted generator to be hooked up at each pump station in case of power failure. Each station is equipped with an auto-dialer, which is programmed to alert the operators to problems that need immediate attention. Five of the nine pump stations were completely overhauled in 2010

The Town Council for the Town of Fremont updates and adopts a 20-year Capital Improvement Plan regularly, to determine the capital needs related to the sanitary sewer system, and prioritize the projects based upon the cost and environmental damage caused by its failure. The Town routinely inspects

approximately 10-15% of the gravity sanitary sewer and manholes on an annual basis to avoid potential overflows and stoppage.

Currently, the Town has one project in design, which is funded through the Community Development Block Grant (CDBG) Infrastructure division of NCDEQ-DWI. The project is intended to address several areas within the system, which are the source of excessive inflow and infiltration (I&I).

The Town of Kenly had zero sanitary sewer overflows (SSOs) in 2019.

What is Inflow/Infiltration (I&I)?

I & I generally come from the unwanted introduction of groundwater and/or stormwater, which enters the sanitary sewer collection system through unintended openings in the system. These openings can be caused by a variety of problems such as:

Separated pipe joints: These usually occur where the pipes join together, which can be caused by settlement, deterioration, or tree roots.

Brick or Deteriorated Concrete Manholes: Many times, after years of use, the hydrogen sulfide (H₂S) gas, which is a by-product of anoxic wastewater, will cause the failure of cementitious products such as mortar and concrete.

Missing Clean-out caps: The brass or PVC caps that close the clean-outs to sanitary sewer services for unclogging services will disappear or destroyed by lawnmowers.

Mis-aligned manhole frames and lids: During construction or other activities, the manhole frame will accidentally be pushed off of the manhole, causing an area for inflow.

Cross-connections to storm drains: Many times there are unintentional connections made between the sanitary sewer collection system and storm drainage. Depending on the size and location, the connections can cause significant I/I.

Sanitary Sewer Overflows:

Most sanitary sewer overflows can be avoided with the help of our customers.

Do Not use the toilet as a wastebasket – place a wastebasket in each bathroom for the disposal of solid waste, disposable diapers, condoms, personal hygiene products that do not belong in the sewer.

Do Not pour grease, fats, and oils from cooking down the drain – Instead, collect the grease in a container and dispose of it as garbage.

Do Not the sink to dispose of food scraps, instead place food scraps in the garbage for disposal with solid wastes, or better yet, start a compost pile.

If our customers have questions or concerns, please don't hesitate to call our public works department at 919-284-2116, and someone will be glad to assist you.