2019-2020 City of Havelock Wastewater Treatment and Wastewater Collection Annual Report

NPDES Permit Numbers NC0021253, NC0078131, WQCS00104

On July 21, 1999, North Carolina Governor James Hunt signed a law, House Bill 1160, that placed reporting requirements on the owners or operators of wastewater treatment and wastewater collection facilities in North Carolina. Part of this new legislation was a requirement to provide the user or customers of the system with an annual report of the past year's performance including a summary of violations.

This report meets these requirements and provides an understandable and informative description of the City's wastewater treatment facility and sewage collection system, describes the regulations with which these facilities must comply, and promotes a general awareness of these facilities and their role in protecting the environment.

Every day, over a million gallons of wastewater begins the journey from kitchen sinks, bathtubs, toilets, washing machines, and dishwashers in homes and businesses, and travels through the Wastewater Collection System in Havelock to the Waste Water Treatment Plant. This report discusses three aspects of the system: Wastewater Collections, the Wastewater Treatment Plant, and the Water Treatment Plant Discharge.

Collection System

The City of Havelock's collection system consists of approximately 60 miles of gravity sewer main,13 miles of force main, and 31 pump stations. The system collects waste water from the homes and businesses throughout the City and transports it via gravity line, pump stations, and force mains to the wastewater treatment facility located on Jackson Drive. The collection system is maintained 24 hours a day in case of any emergency that may arise. The City's pump stations are equipped with supervisory controls and data acquisition (SCADA) monitoring systems that alert City staff to any potential malfunctions via telephone and email.

The City has been in contact with NC Department of Environmental Quality (NC DEQ) and is working diligently to eliminate the sewer overflow issues caused by excessive water getting into the system during heavy rain events (See Figure 1 below). The City has invested hundreds of thousands of dollars in the effort to locate and repair rainfall inflow and infiltration (I&I) into the collection system. The City has completed and has several on-going projects to improve the system including replacing sections of sewer main on McCotter Boulevard, Woodhaven Drive and Wynne Road, and overhaul of the pump station on Pineview Street. City staff will conduct smoke testing and CCTV of gravity mains on the east end of the City to further identify areas needing to be repaired.

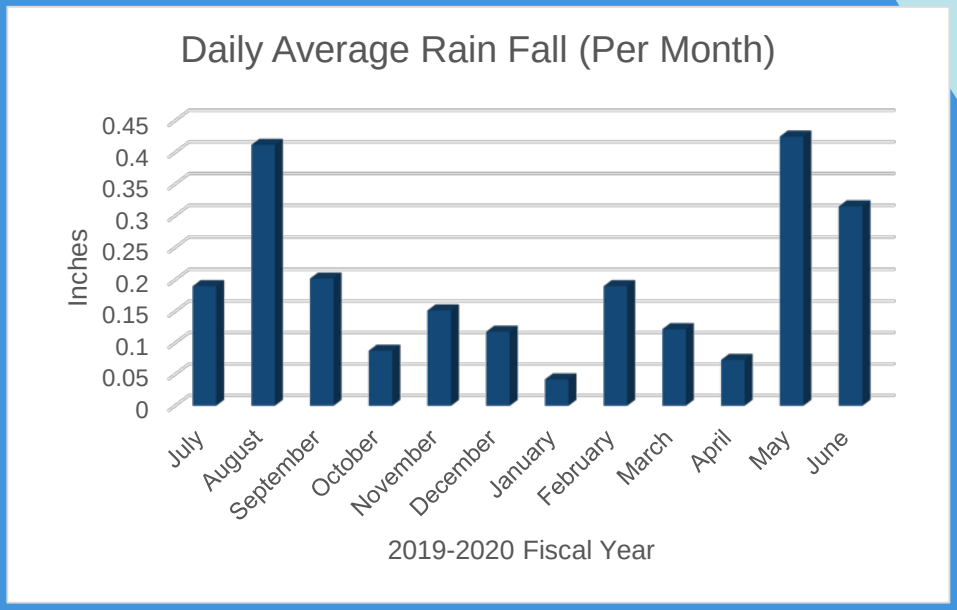

Figure 1

Wastewater Treatment Plant

Between one and two million gallons of raw sewer reach the Waste Water Treatment Plant (WWTP) each day (See Figure 2). Once at the treatment plant the wastewater enters a bar screen and grit removal system. In this system, rags, sticks, large inorganic particles, and grit are removed to improve performance and prevent excessive wear on other process equipment. The wastewater is then pumped to the complete mix aeration basins for Biochemical Oxygen Demand (BOD) removal, then flows to three second-stage aeration basins where nitrification (conversion of ammonia to nitrate nitrogen) occurs (See Figure 2). Next, the wastewater flows into two final clarifiers where bio-solids settle to the bottom and the clear treated water flows from the top of the clarifiers to a set of three denitrification filters, providing tertiary treatment (effluent polishing). As the water travels through the filters, any remaining fine particles are removed and nitrate nitrogen is converted to nitrogen gas (See Figure 3).

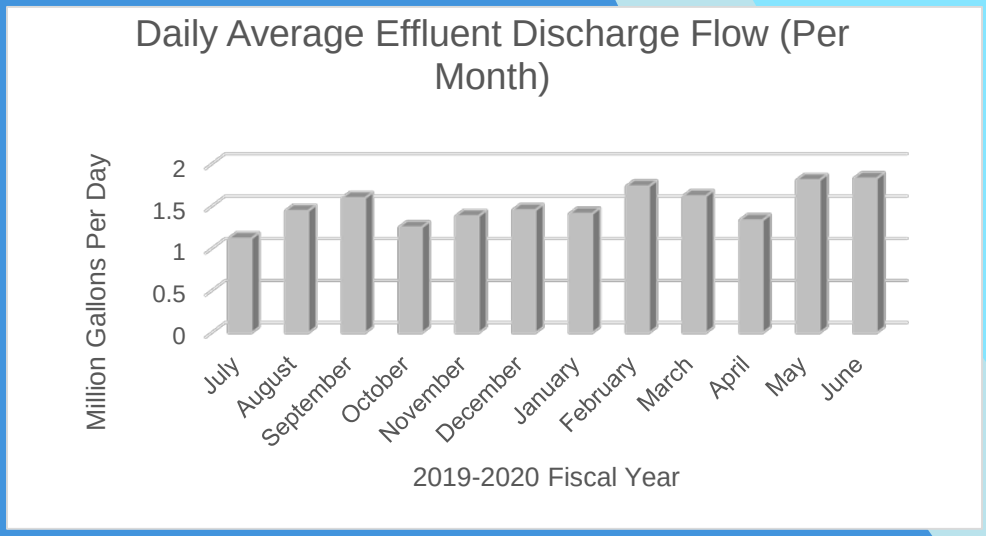

Figure 2

The clean water from the denitrification filters subsequently flows to the final ultraviolet disinfection facility for the destruction of harmful microorganisms. Flow from the plant is recorded by a magnetic flow meter. Samples are taken and parameter testing is done per the City's required NPDES permit (See Figures 4 and 5).

Figure 3

Parameter Monitored	****NPDES Permit Limit*** *Summer*	****NPDES Permit Limit*** *Winter*	***Average for 2020 Calendar Year***
Biochemical oxygen demand (BOD)	***5.0mg/L***	***10.0mg/L***	***4.17 mg/L***
Total Suspended Solids (TSS)	***30.0 mg/L***	***30.0 mg/L***	***0.17 mg/L***
Total Phosphorous	**2.0 mg/L**		***0.53 mg/L***
Total Nitrogen lbs./Year (Annual Limit)	***21,400 lbs. (Per calendar year)***		***17326 TOTAL lbs. (2019)***
Total Nitrogen lbs./Year (Annual Limit)	***21,400 lbs. (Per calendar year)***		***7988.6 YTD lbs. (To June 2020)***

Figure 4

Removal Percentages	
BOD Effluent Removal	99%
TSS Effluent Removal	99.80%
Total Nitrogen Effluent Removal	95.20%
Total Phosphorus Effluent Removal	84.30%

Figure 5

Biochemical Oxygen Demand

Of the permit parameters, Biochemical Oxygen Demand (BOD) is the amount of oxygen required for microbial metabolism of organic compounds in water. This demand occurs over some variable period of time depending on temperature, nutrient concentrations, and the enzymes available to indigenous microbial populations. The amount of oxygen required to completely oxidize the organic compounds to carbon dioxide and water through generations of microbial growth, death, decay, and cannibalism is total biochemical oxygen demand (total BOD). Total BOD is of more significance to food webs than to water quality. Dissolved oxygen depletion is most likely to become evident during the initial aquatic microbial population explosion in response to a large amount of organic material. If the microbial population deoxygenates the water, however, that lack of oxygen imposes a limit on population growth of aerobic aquatic microbial organisms resulting in a longer term food surplus and oxygen deficit. (1)

BOD is measured in natural waters, as well as treated effluent as an indirect measure of quantities of organic compounds. Aquatic microorganisms have evolved to use some of these compounds as food. Microorganisms living in oxygenated waters use dissolved oxygen to oxidatively degrade the organic compounds, releasing energy which is used for growth and reproduction. Populations of these microorganisms tend to increase in proportion to the amount of food available. This microbial metabolism creates an oxygen demand proportional to the amount of organic compounds useful as food. BOD in treated effluent must be in keeping with the regulated threshold of receiving waters.(1)

(1) Wikipedia contributors. (2020, May 4). Biochemical oxygen demand. In Wikipedia, The Free Encyclopedia. Retrieved 11:41, July 6, 2020, from https://en.wikipedia.org/w/index.php?title=Biochemical_oxygen_demand&oldid=954775342

Sanitary Sewer Overflows

Sanitary Sewer Overflows (SSOs), while not common, do occur for various reasons. Sanitary sewer overflows which occurred in Havelock during the 2019-2020 fiscal year are see below (Figure 6). An SSO occurs when wastewater escapes from the wastewater collection system to the surrounding ground or nearby surface waters. By regulation, NC DEQ defines a reportable SSO as any sewer spill to the ground in excess of 1000 gallons ***OR*** any spill, regardless of the amount, which reaches any surface waters. During the 2019-2020 Fiscal Year, the City had eight reportable SSOs.

Date	Amount (gallons)	Duration (hours)	Location or Manhole(s)	Cause
9/5/2019	58,500	19.5	G111	Hurricane Dorian
9/9/2019	19, 500	9	G111	Rain event
10/20/2019	33,750	4.5	G111	Tropical Storm Nestor
12/9/2019	23,400	5.5	G111	Rain event
5/18/2020 - 5/22/2020	277,150	35.5	G101, G166, G137, G106, P43	Tropical Storm Arthur
5/28/2020	48,000	6	G101	Tropical Storm Bertha
6/15/2020- 6/16/2020	45,750	9.5	G101	Rain event
3/5/20- 3/6/20	150,000		Waste Water Treatment Plant	Lightning Strike at WWTP

Figure 6

SSO CORRECTIVE ACTIONS

SSO Follow-up actions depend on the cause and severity of the spill and may include:

- *Clearing of mains*
- *Cleanup*
- *Disinfection*
- *Inspection*
- *Repair, renovation or replacement of pipes*
- *Increased inspections or other maintenance as needed*
- *Replacement of sewers or pump equipment with larger capacity facilities, in some cases.*

SSO PREVENTION

- *Inspect, repair, renovate or replace sewer lines and pump stations as needed to eliminate leaks or to increase system capacity.*
- *Inspect and clear collection system lines.*
- *Clear collection system easements to keep roots from growing into collection lines; limit plantings allowed along easements.*
- *Operation and continuous monitoring of alarm systems at pump stations; maintain and repair pumps; use generators for backup power; replace pump stations with gravity sewers when practical; monitor and inspect pump stations to identify repairs needed.*
- *Ask customers to contact the City if they see debris or trash being deposited into the collection system.*

Water Plant Backwash Water Treatment System

In addition to the WWTP, the Water Treatment Plant (WTP) has a waste water aspect. The WTP processes include a Backwash Holding System consisting of a 425,000-gallon settling basin, where the backwash waste is deposited. Settling in the basin for hours, the clear water off the top goes to a “polishing” basin to settle more, it leaves there to dichlorination to remove any chlorine and then is discharged into receiving ditches and the McCotter Canal. The solids on the bottom of the settling basin are pumped to one of six drying beds where it is dried out and properly disposed. The current NC State Permit that the City holds states a level dissolved metals, including copper, not met. In 2019 the City was able to solve the issue with the failing toxicity tests, but was still unable to meet the copper limits. There are no violations as the City is in a monitoring period with plans for process revisions to meet the limits for copper within the permitted time period.

Special Order of Consent

The City is under a State of North Carolina Special Order of Consent (SOC) which covers Wastewater collection system. The SOC has identified and mandated specific system repairs, as well as fines, and a timeline schedule for repairs.

WHAT YOU CAN DO TO HELP

- Limit your personal use of pesticides and fertilizers. Use and dispose of toxic chemicals properly. Take used motor oil to a recycling center.

- To prevent sanitary sewer overflows, dispose of cooking oils and grease as a solid waste in your home garbage container. Never pour oil or grease into sink drains, garbage disposals, or toilets.

- Repair broken clean-outs and replace broken or missing clean-out caps on your household sewer line as they occur. Make sure that none of your household gutters are transporting rainwater into the sewer system. Treating rainwater adds to every customer's cost and can lead to fines for the City.

- Do not flush disposable wipes, diapers or any paper products other than toilet paper down the drain.

- Use water wisely. Repair leaks in household plumbing promptly. Irrigate your lawn or garden only in the early morning or late evening hours. Do not let water continue to run while shaving or brushing your teeth.

How to Contact Us:

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Copies of this report are available at the City of Havelock Water Billing Office and on our website: www.havelocknc.us

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City of Havelock Water Plant Backwash Facility, Telephone: (252) 444-6420 David Hemmingway, ORC

City of Havelock Wastewater Collection System, Telephone: (252) 444-6415 Eric Smith, ORC