Where does the waste originate from?

- Private homes
- Businesses
- Condominium complexes
- Nursing homes
- Apartments

ANY DWELING THAT USES WATER AND IS CONNECTED TO THE SEWER SYSTEM WITHIN DISTRICT #3
SANITARY SEWER DISTRICT #3

- **Collection area**
  - Freeport to Suffolk Border
  - LIE to Great South Bay
  - The district has approximately 40,583 lines
    - Equating to 1,528 miles of sewer pipe
How does it get here?

- The sewage flows from homes and businesses into laterals within the street adjacent to the property.
- The laterals feed into mains which flows primarily by gravity to the waste water plant, maintaining a minimum velocity of 2-feet per second.
What happens in low lying areas?

- When the sewage can no longer flow by gravity due to the low lying topography, it is raised up utilizing lift / pump stations.
- Once lifted gravity continues to move the sewage to the treatment facility.
- Depending on the location of original sewage it may need to be lifted / pumped several times before it arrives at the treatment plant.
Pump Station (Submersible Pumps)
Pump Station (Dry Well Pumps)
Waste Water Treatment Systems

Fixed growth systems

- RBC’s
- Trickling Filters
  - Less technologically advanced
  - Effluent quality (moderate to good)
  - Less capital cost
  - Typically less operating cost than suspended growth
Waste Water Treatment Systems

Suspended growth systems (CEDAR CREEK WPCP)

- Activated Sludge
  - More technologically advanced
  - Better effluent quality (good to excellent)
  - More capital costs
  - Typically more operating costs than fixed growth
Suspended Growth (activated sludge)

- There are different modes of operations for activated sludge processes:
  - Conventional-plug flow *(CEDAR CREEK WPCP)*
  - Step-feed
  - Contact Stabilization
  - Extended aeration
  - Cannibal processes (specialized process)
  - Ponds & Lagoons (most basic process)
Cedar Creek Plant Overview

- Preliminary Treatment
- Primary Treatment
- **Secondary Treatment**
- Disinfection / Discharge
- Solids Handling
- Power Generation
- Ancillary Equipment
Preliminary Treatment

- Protects downstream equipment from damage (Pumps & Piping)
  - Bar Screens – remove solid material (paper, plastics, ect...)
  - Grit Removal – removes inorganic abrasive material (sand, fine rocks, pebbles) by slowing the velocity of the sewage down to approximately 1-Ft/sec
CEDAR CREEK WPCP
Primary Treatment

- Primary Clarifiers (10-units in total)
  - Removes up to:
    - 99% of settleable solids
    - 40 -60% suspended solids
    - 10 -15% total solids
    - 20 – 40% BOD

Accomplished by slowing the velocity of the sewage down to achieve gravitational settling
<1-Ft/sec – detention times 2-3 hours
Secondary Treatment

- Secondary treatment is composed of aeration basins (6-units / 4-passes) & final clarification (12-units)
- In the secondary treatment process bacteria is cultured within a controlled environment (AERATION TANKS)
- The bacteria reduces the pollutants (BOD, TSS ect...) to acceptable levels prior to discharge, detention times 6-8 hours
- Final clarifiers rely upon gravity settling to separate the solids from the treated water, detention times 1-3 hours
Secondary Overview

Aeration Tanks
(mixed liquor suspended solids)

Final Clarifiers

Effluent

Primary Effluent

Return Activated Sludge (RAS)

Gravity Belt Thickeners

Waste Sludge (WAS)
How do I check my bacteria?

- Bacteria are extremely small, and measured in units called (microns), one micron = 1/1000 of a millimeter
- Since bacteria is so small and can not be seen under a regular microscope, we rely upon indicator organisms to determine the amount of bacteria we are culturing
Indicator organisms

- Flagellates
- Amoeboïds
- Free swimming ciliates
- Stalked ciliates
- Rotifers
- Nematodes
Disinfection / Discharge

- By the time the sewage exits the final clarifier's it has undergone secondary treatment, however it still contains pathogenic bacteria.
- The pathogens have to be reduced through the process known as disinfection.
- Disinfection is accomplished with sodium hypochlorite prior to discharge to Atlantic Ocean (approximately 6-miles from CC-plant).
CEDAR CREEK WPCP
Solids Handling

- **Thickening**
  - The sludge that is not returned to the aeration system is treated through a process known as thickening.
  - WAS waste activated sludge is mixed with cationic emulsion polymer.
  - The polymer reacts with the sludge causing the sludge particles to coagulate allowing the trapped water to drop out.
Why do we thicken sludge?

- To reduce the volume
  - WAS (waste activated sludge) is <1% solid
  - After thickening it is between 4% to 8% solid
- Save money
  - The energy expenditure to heat the water is tremendous
- Aid the Process
  - Un-thickened sludge would greatly reduce the detention time in the digesters
Solids Handling

- **Digestion**
  - Digestion is the process of volatile solids reduction of the primary and secondary sludge, accomplished by bacteria
    - Acid formers & methane fermenters
    - The organisms operate in the mesophilic range (98°F)
  - Detention time, approximately 21-days
Solids Handling

- Digestion (continued)
  - By products of digestion
    - Methane gas * utilized in power generation & mixing
    - Carbon dioxide
    - Water vapor
  - Digesting the sludge allows for more disposal options
Solids Handling

- Dewatering
  - Dewatering is the process of removing excess water from the digested sludge prior to disposal
  - Primary and secondary sludge that has undergone digestion are treated with cationic emulsion polymer, which reacts with the sludge causing the sludge particles to coagulate
Solids Handling

- **Dewatering (continued)**
  - After conditioning the sludge is applied to the BFP (Belt Filter Press)
    - **Gravity zone** – gravitational liquid separation
    - **Low pressure zone** – low pressure exerted to remove water from the sludge
    - **High pressure zone** – high pressure exerted to remove excess water from the sludge
  - **Sludge enters BFP at 1% to 3% solid**
  - **Sludge exits BFP at 17% to 20% solid**
Power Generation

- The Cedar Creek Facility does not import power from the grid, all plant power is produced in-house
- (5) Tri-fuel engine generators
  - Natural Gas
  - #2 Fuel Oil
  - Bio-Gas (methane from the digestion process)
- PSEG feeder influent / effluent pumping
Ancillary Equipment

- **Odor Control**
  - The plant mitigates odors through the use of wet chemical scrubbers
    - NaOH
    - NaOCL
  - The plant also utilizes a bio-filter to mitigate odors emanating from the biological process
    - Wood Chips
    - Water mist
Ancillary Equipment

- NOSE System
  - Real time odor control monitoring and modeling system
  - 10-data points around the perimeter of the facility with constant odor control monitoring and recording
Who monitors the plant?

- NYSDEC
  - SPDES Permit
    - Monthly DMR
  - Title-V Air Permit
    - Bi-annual emission reports
    - Annual report
- DMR-QA
  - Annual laboratory monitoring / reporting
Main Wastewater Treatment Requirements

- TSS = 30 mg/l (30-day average)
- BOD = 25 mg/l % (30-day average)
- Removal = 85% (30-day average)
Questions