City of Eaton
Wastewater Treatment Plant

Zac Wilson

October 11th, 2018

Where and What is Eaton?

- Population= 8,400
- Attractions
  - Pork Festival
  - Whispering Christmas
  - Roberts Covered Bridge

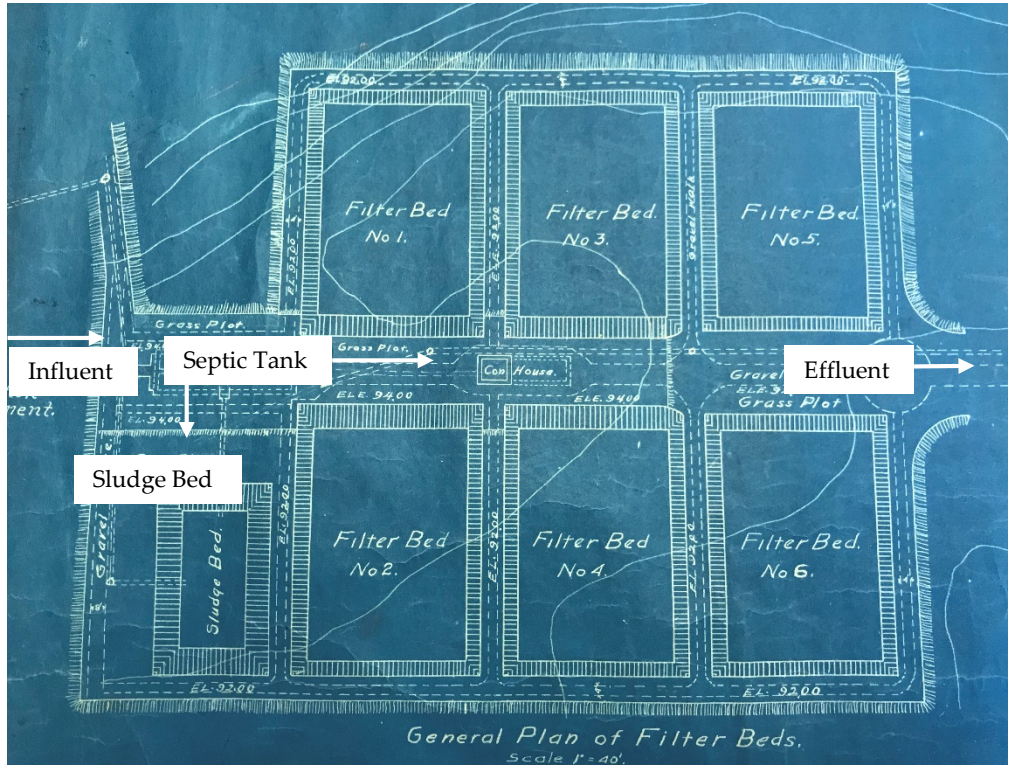
Snapshot About Me and Discussion Topics

- Zac Wilson
  - Assistant Superintendent
  - Eaton Public Works Division- 3.5 years
    - Part time summer worker- 4 years

- Topics
  - History of the Plant
  - Current Treatment Plant Process
  - The Future and Operational Challenges

Days of Old

- First wastewater treatment plant facility at present site was constructed in 1909
- Consisted of:
  - Septic tank
  - 6 sand filters
  - 1 sludge drying bed



Days of Old

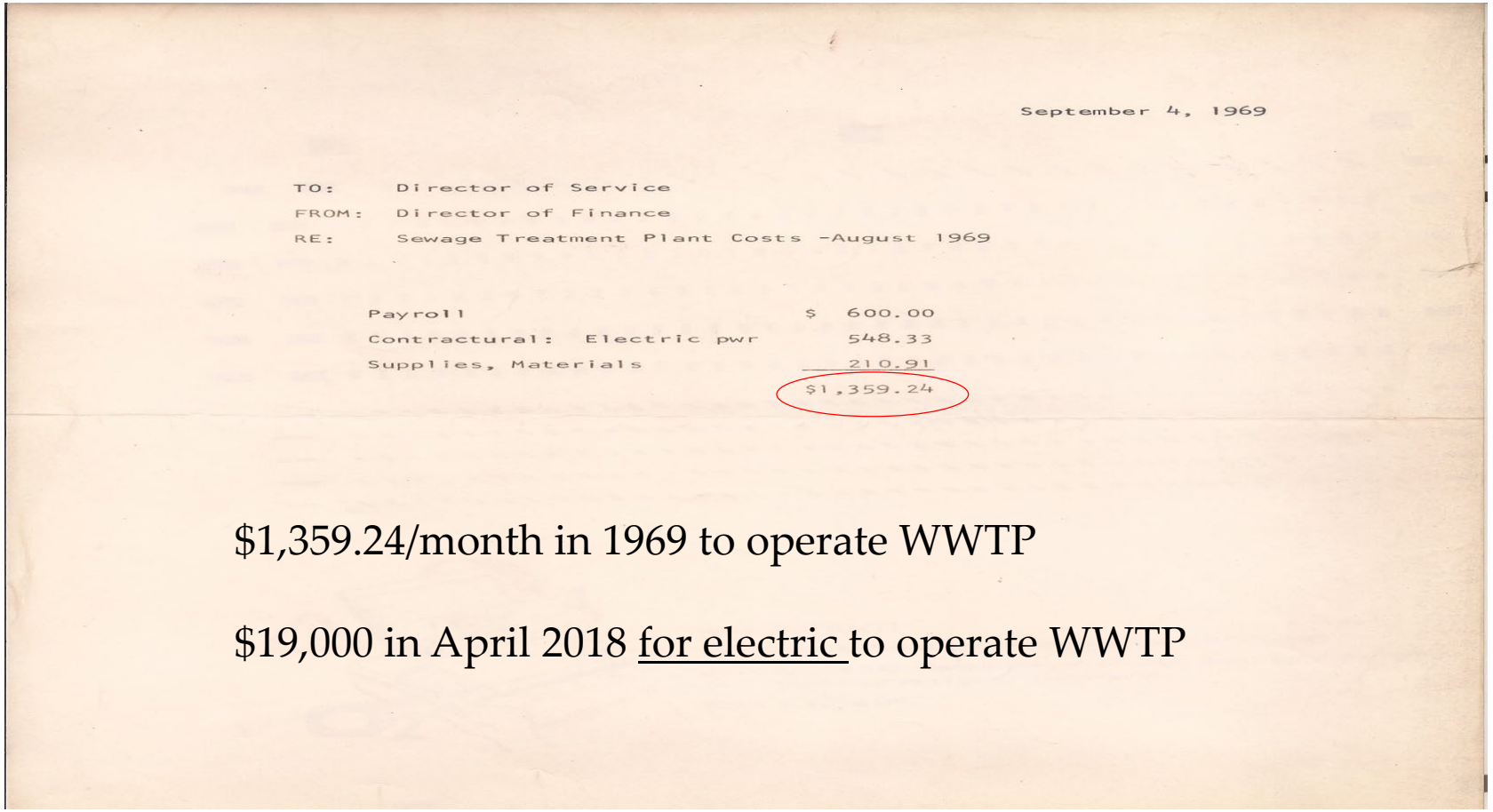
- By 1940- Improvements were added which include:
  - Two additional filter beds
  - Bar screen
  - Primary sedimentation tank
  - Additional sludge drying beds
  - Conversion of septic tank to a cold primary sludge digestion and storage tank

1956

Days of Old

- In 1965 the facility was once again upgraded/expanded
  - Secondary Clarifiers
  - Final Sedimentation Tanks
  - Return Pump Facility
  - Laboratory
  - Aerobic Digesters

1969 WWTP Operational Cost



September 4, 1969

TO: Director of Service
FROM: Director of Finance
RE: Sewage Treatment Plant Costs -August 1969

Payroll	$ 600.00
Contractural: Electric pwr	548.33
Supplies, Materials	210.91
	$1,359.24

$1,359.24/month in 1969 to operate WWTP

$19,000 in April 2018 for electric to operate WWTP

The Clock was Ticking

- 1972- Clean Water Act was passed and Ohio EPA was created
- 1972- Ohio Water Pollution Control Board finds Eaton WWTP in violation of Water Quality Standards
- 1974- Facilities Plan/Design
- The WWTP was coming to the end of its life in 1980 and was in need of a major upgrade
  - Failure to comply with NPDES limits
  - Operations and equipment was outdated

The Clock Keeps Ticking since 1983…

- Construction of the current facility began in 1980 and was completed in the fall of 1982 into 1983
  - $7 Million Dollars
- Current system is the same process that was completed in 1983
- Key Improvements:
  - 1997- Mechanical Mixing Unit- Anaerobic Digester
    - Replaced a compressed gas system
  - 1998- Odor Control System- Primary Clarifiers
    - Fabric covers and scrubber system installed
  - 2017- New Fine Screen
  - 2017- New Primary Clarifiers

That was Then, This is Now

1956

2018

Staff and Job Responsibilities

- Staff
  - Superintendent
  - Assistant Superintendent
  - Lab Analyst
  - Operators (5) (dual certified)
  - Utility Supervisor
  - Utility Workers (2)

- Operate and maintain a WWTP, Two Water Plants, 8 Wells, 8 Lift Stations, and Collection and Distribution Systems

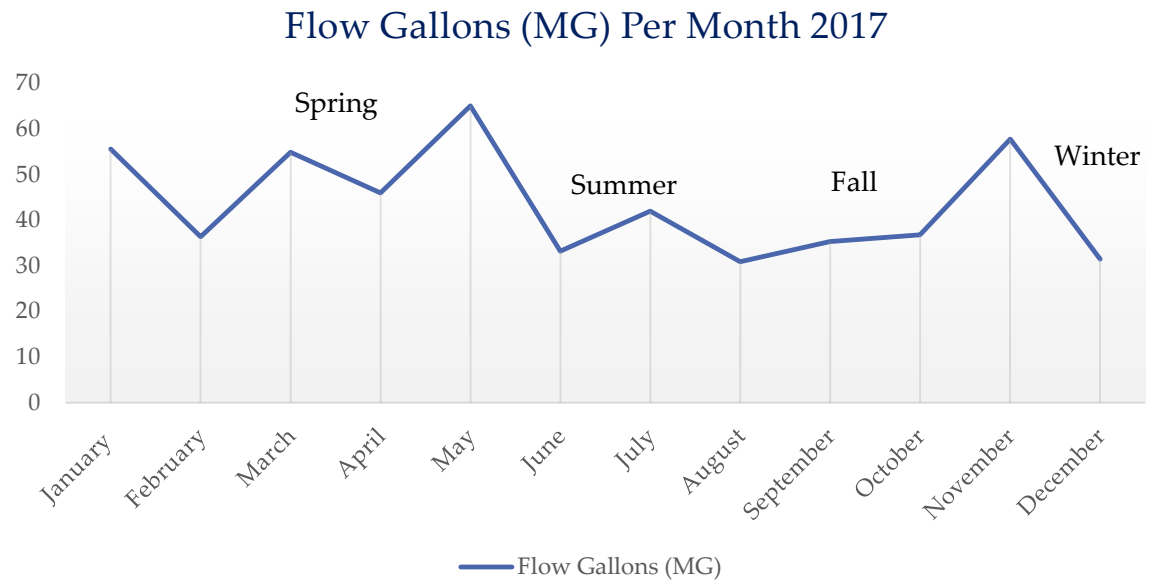

FOUNDED

Eaton WWTP

2017 Flow Averages

2017 Averages	Design	Operating
Flow (MGD)	1.9 MGD	1.44 MGD
Peak Flow (MGD)	6.0 MGD	

- City Population= 8,400
  - Plant Design= 14,000



EATON WWTP

Permit and Performance

2017 Averages	INFLUENT	EFFLUENT	EFFLUENT PERMIT LIMIT
BOD	54.44 mg/L	1.19 mg/L	12.0 mg/L weekly
TSS	77.74 mg/L	1.51 mg/L	18.0 mg/L weekly
AMMONIA	12.03 mg/L	0.06 mg/L	1.5 mg/L weekly (summer) 5.7 mg/L weekly (winter)
PHOSPHORUS	Approx. 3.25 mg/L	2.07 mg/L	

MLSS= 2,500-4,000 (summer and winter months)
SVI= 80-120
pH= Between 6.5 and 9.0 at all times
Dissolved Oxygen= Effluent greater than 5.0 mg/L

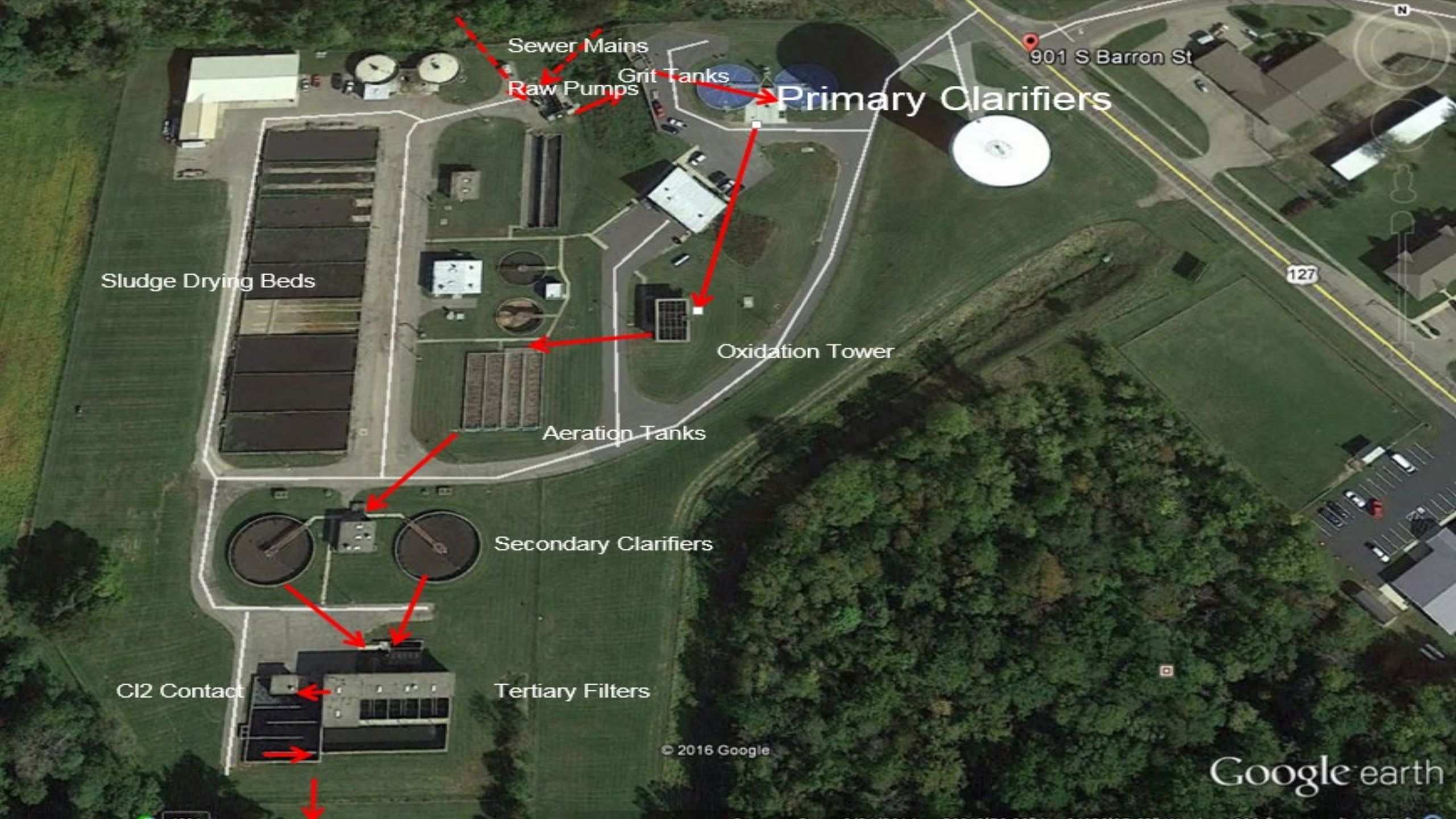
Plant Performance

2017 Removal %

Month:	CBOD Removal %	TSS Removal %	NH3-N Removal %
January	97.82	97.34	99.53
February	98.03	98.14	99.72
March	97.50	97.32	99.37
April	97.63	98.18	99.63
May	96.45	97.52	99.37
June	97.72	98.22	99.60
July	98.21	98.22	99.65
August	98.68	98.53	99.70
September	98.40	98.31	99.45
October	98.52	98.55	99.04
November	95.29	98.21	99.46
December	98.07	97.46	99.74
Average	97.69	98.00	99.52
Maximum	98.68	98.55	99.74
Minimum	95.29	97.32	99.04

Pump Stations

- 8 total lift stations:
  - East side- 60% of influent flow
  - Walmart
  - Washington Landing
  - Mound Hill
  - Sunrise Circle
  - Sugar Hill
  - 7 Mile Park
  - Fort St Clair
- 40 miles of sanitary sewer
- Over 700 manholes


Sewer Mains
Raw Pumps
Grit Tanks
Primary Clarifiers
901 S Barron St
127
Sludge Drying Beds
Oxidation Tower
Aeration Tanks
Secondary Clarifiers
Cl2 Contact
Tertiary Filters
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Google earth

Headworks

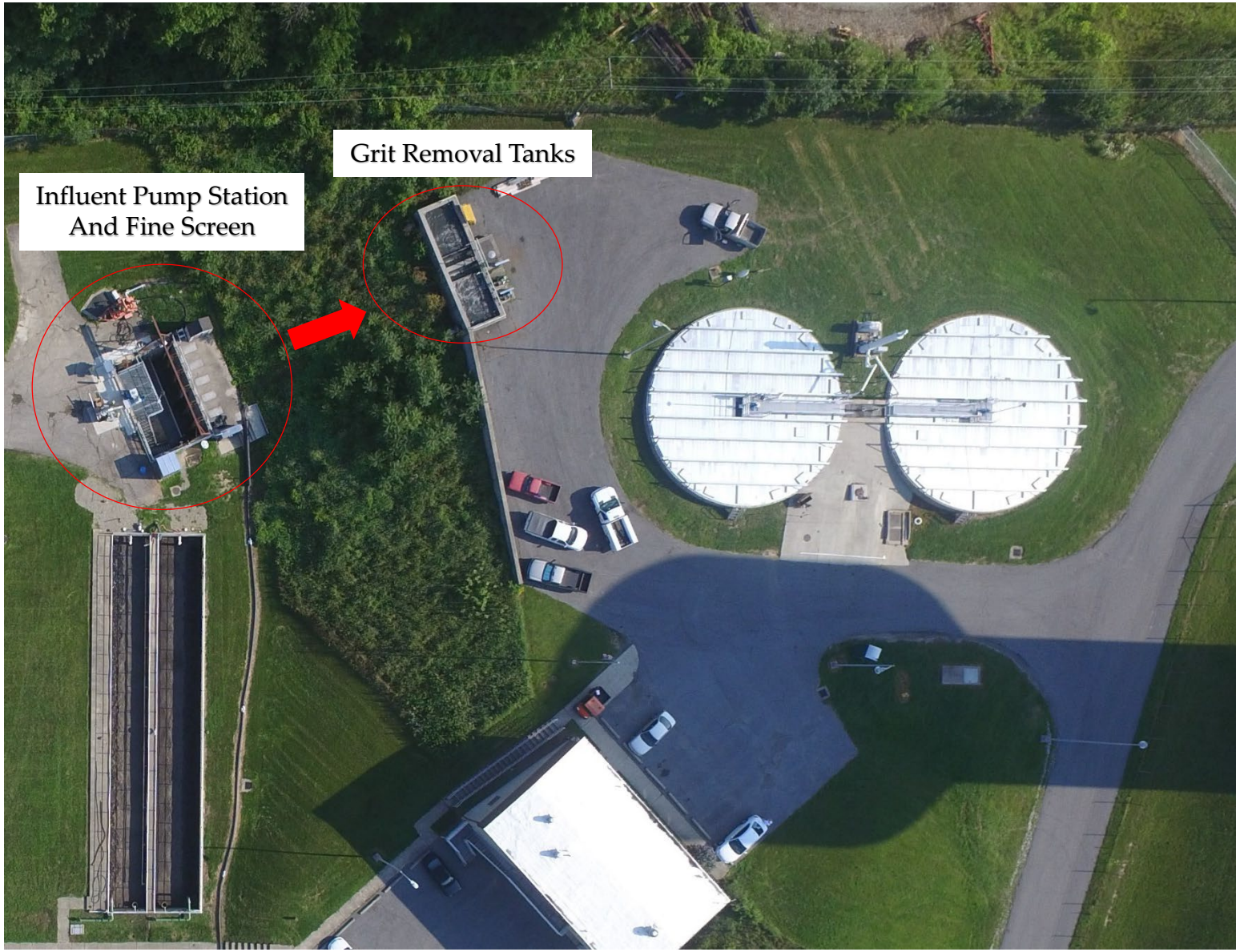
Fine Screen- "The Game Starts Up Front in The Trenches"

- Receives both domestic and industrial wastes
  - (approx. 30% of flow is from industrial sources)
- Fine Screen:
  - 1 Huber RakeMax Multi-Rake Bar Screen
    - Auger, Compactor, and Shoot
    - Controlled by a timer and flow
    - Handles peak flows
    - Cold temperatures
  - 1 Bypass Bar Screen
    - Requires Manual Cleaning

Headworks

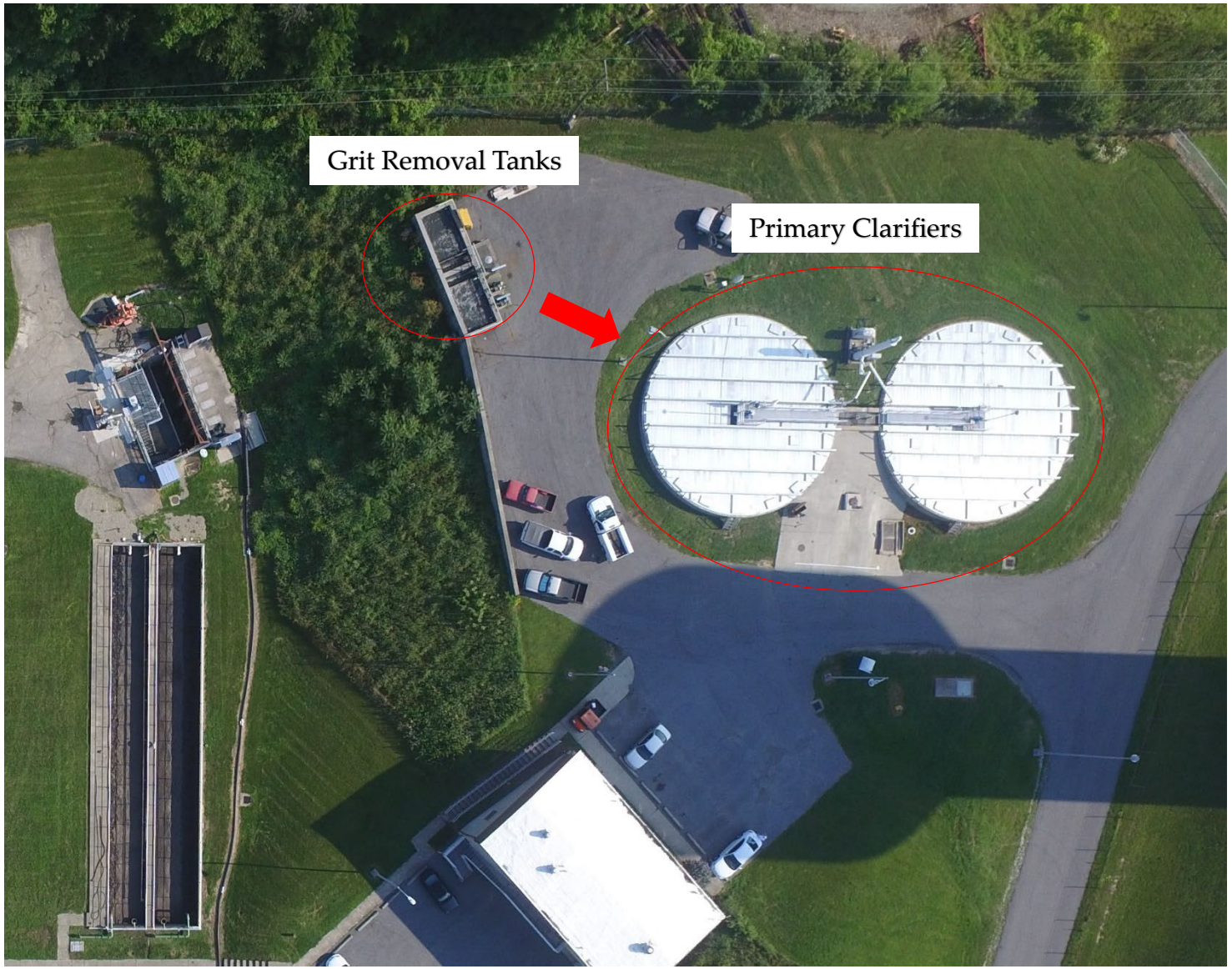
Raw Pump Station

- 5 raw sewage pumps
  - Rated together at 6 MGD
  - Two Flygt pumps rated at 700 gpm (20HP)
  - Three Flygt pumps rated at 1500 gpm (35HP)
    - Two of these pumps are controlled by VFDs
    - Keeps a constant and consistent flow through the plant
    - Eliminates the spikes which causes rapid change in the process conditions


Grit Removal Tanks
Influent Pump Station
And Fine Screen

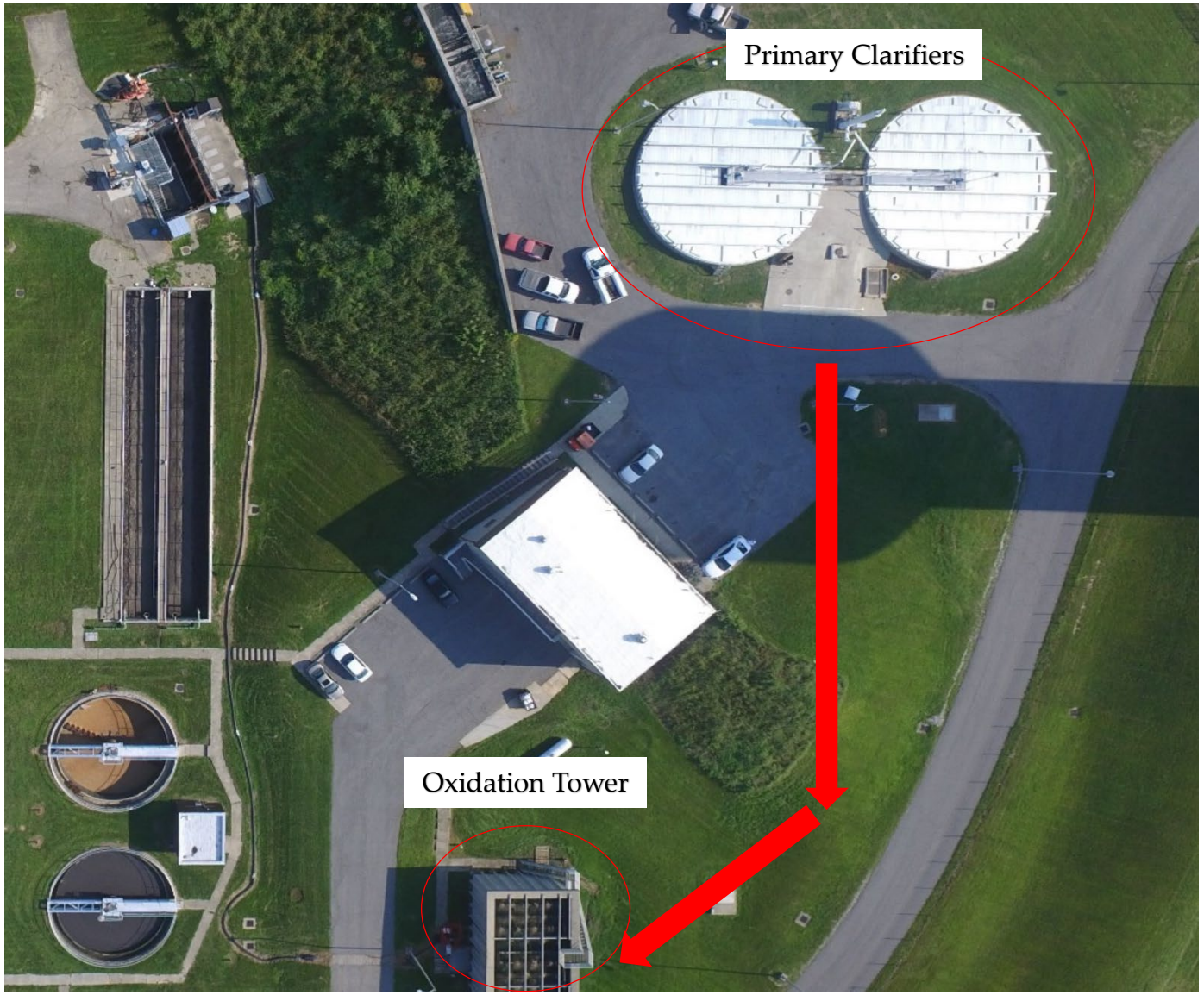
Grit Removal

- Two aerated grit tanks
  - Size= 10,000 gallons each
    16’ Long, 9’ Wide, 9’ Deep
  - Aerated by two positive displacement blowers
  - Air creates a roll in which enables inert solids to settle and organic solids to be carried over.
  - Design Flow of 1.9 MGD= 0.018 feet per second
  - Detention time of 21 minutes at 1.5 MGD and 5 minutes at 6 MGD
  - Grit is removed as needed by a vac truck


Grit Removal Tanks
Primary Clarifiers

Primary Clarifiers

- Two Primary Clarifiers
  - 1 primary in operation for dry weather
  - Both clarifiers during high wet weather flows
  - Size= 55’ diameter, 12’ deep, 213,000 gallons each
  - Detention time= 5 hours
  - Remove settable solids and floating material
  - CBOD5 and TSS reduction
- Brand New! (2017)
  - Aluminum Covers, Drive Unit, Bridges, Scraper and Scum Beaches


Primary Clarifiers
Oxidation Tower

Bio-Oxidation Tower

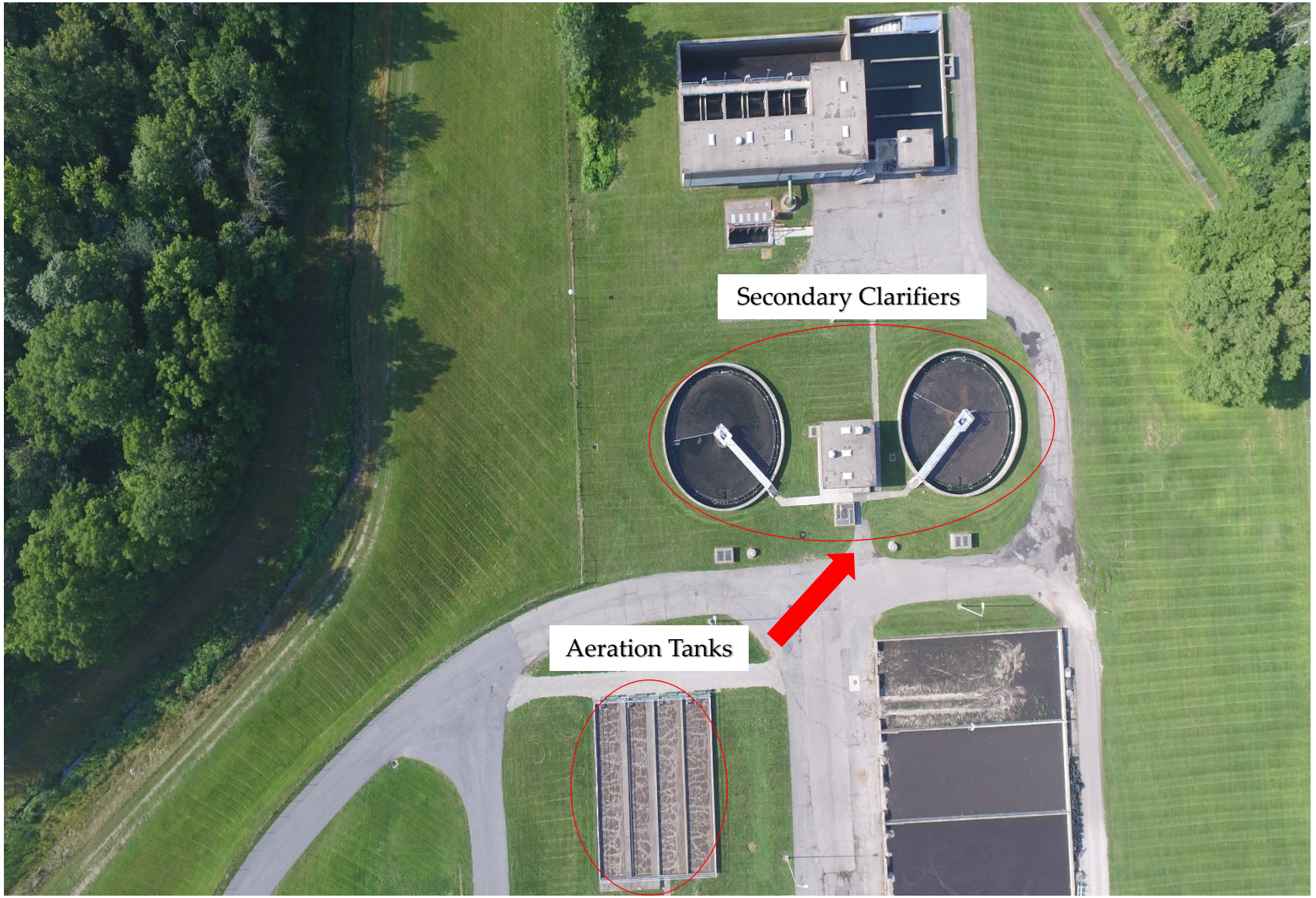
- The WWTP utilizes the two stage Activated Bio-Filter (ABF) process
  - All of the flow must pass through the Bio-Oxidation Tower which is responsible for most of the CBOD oxidation
  - This helps reduce CBOD5 and ammonia
- Flow to the tower comes from the primary clarifier effluent which is combined with RAS from the secondary clarifiers
- Filters through redwood media
- 1980s Chicken Plant


Aeration Tanks
Oxidation Tower

Aeration- Nitrification Tanks

- Unit Process Data:
  - Four Tanks
  - Size= 84,600 gallons each
    338,400 gallons total
    78’ long, 14.5’ wide, 10’ deep
- Operated in a Plug Flow mode
- Help further reduce CBOD and provide a high degree of nitrification
- High dissolved oxygen of at least 3.0 mg/L is required in these tanks for the oxidation of ammonia
  - Control air by choking blower inlets

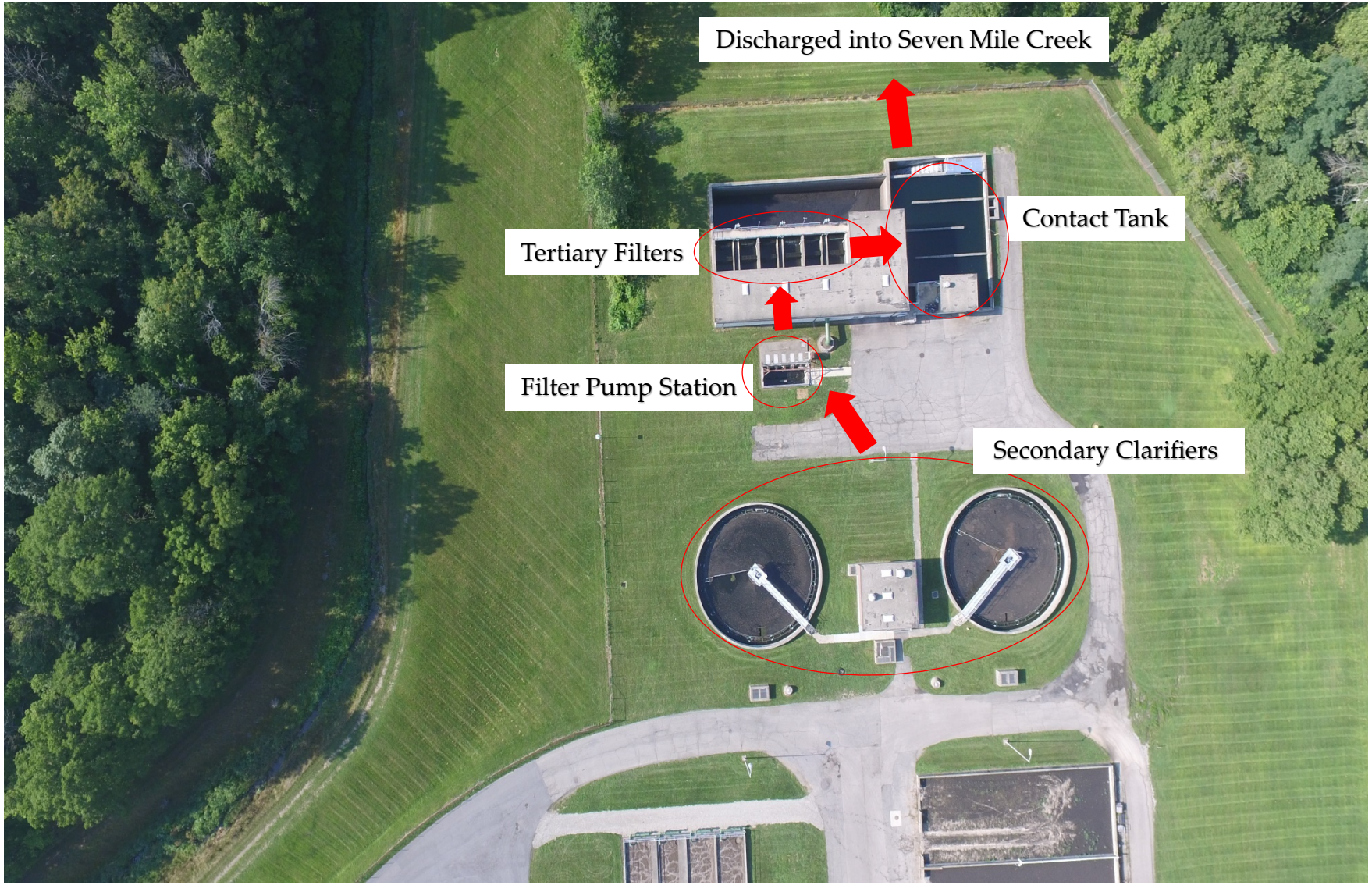

HOFFMAN
HOFFMAN


Secondary Clarifiers
Aeration Tanks

Secondary Clarifiers

- Two Secondary Clarifiers
  - Size= 65’ diameter, 10.5’ deep,
    260,500 gallons each
  - Sludge is removed from the bottom of the secondary's by the RAS pumps and returned back to the Oxidation Tower
  - Waste off RAS Line
  - Aging
    - Floor
    - Troughs
    - Drive unit


Wemco RAS Pumps


Discharged into Seven Mile Creek
Contact Tank
Tertiary Filters
Filter Pump Station
Secondary Clarifiers

Filter Pump Station

- Secondary effluent travels over the weirs and into the filter pump station
- This is equipped with five submersible Flygt pumps
  - Two pumps rated at 700 gpm
  - Three pumps rated at 1500 gpm
  - (very similar to the raw pump station)
- The lift station pumps the effluent into an elevated concrete box that distributes flow into three filter bays

Tertiary Filters

- Three rapid sand filters
- 21 feet long, 10.5 feet wide, 16 feet deep
- Dual media consisting of anthracite and sand for filtration
- Filter system has two backwash pumps, two mudwell pumps, and two air scourer blowers.
- 4 mgd is when the filters become blinded
- The final filters are a safety net for capturing excess solids that escaped secondary clarification and help polish final effluent

Disinfection

Contact Tank

- The effluent from the filters flows by gravity to the chlorine contact tank for disinfection
  - Size of Contact Tank= 340,000 gallons
  - Used for filter backwash source water
- Disinfection Method= Chlorine Gas 150 lb cylinders
- Dechlorination is accomplished by using 40% sodium bisfulfite

Sludge Handling

- Sludge Thickeners
  - Two sludge thickeners (53,300 gallons each)
  - Purpose is to remove excess liquid from the sludge and increase sludge concentration
- Supernatant Processing Tanks
  - Two aerobic digesters (123,600 gallons each)
  - Process involves direct oxidation
  - Aerated with coarse bubble diffusers
  - Temporary shut the air supply off so we can decant as required
  - Send to drying beds

Thickener Tank

Supernatant Tanks

Sludge Handling

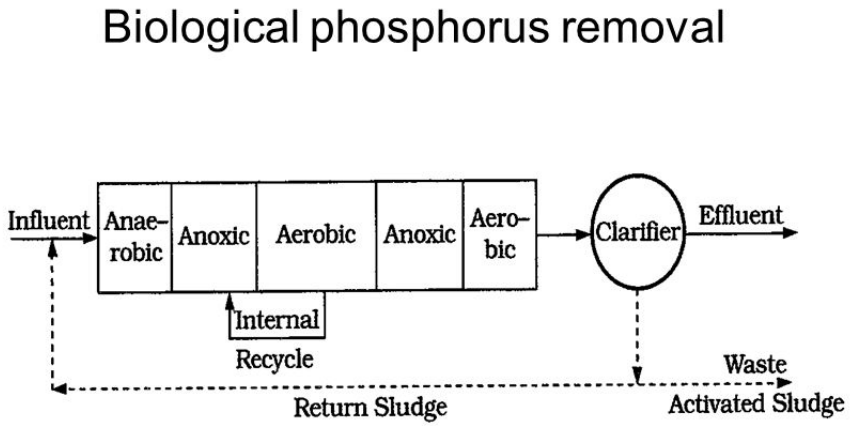
- Anaerobic Digesters
  - Two anaerobic digesters (187,900 gallons each)
  - One digester is a primary which is heated and mechanically mixed
  - The other digester is the secondary which is unheated and not mixed
  - Both digesters have floating covers
  - Heat exchanger boilers can be fired either by digester gas and/or fuel oil

Sludge Handling

- Sludge Drying Beds
  - Nine drying beds (100’ long, 40’ wide)
  - Used to dewater the sludge
  - Only process in the plant where polymer is used
  - Dry sludge is hauled to the landfill
  - Takes 1-3 months for a bed to dry

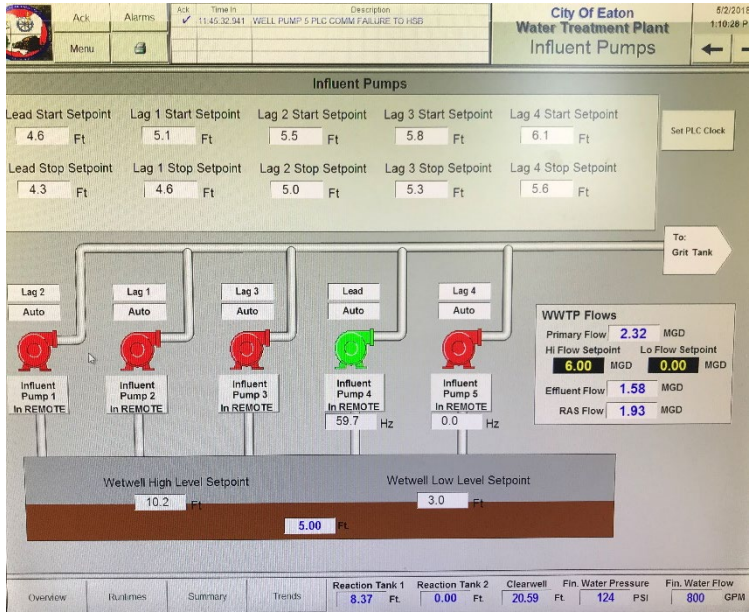
Future Challenges

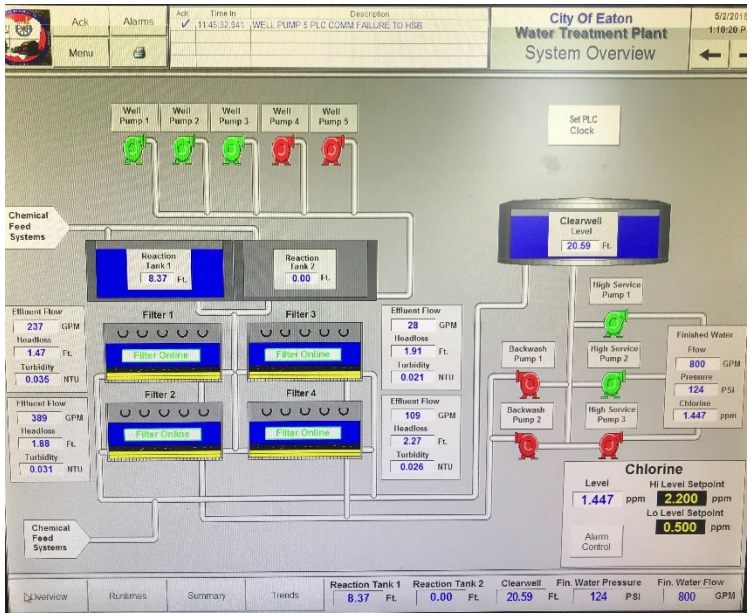
- Phosphorus Removal
  - Effluent limit= 1.0 mg/L
  - 2017 average= 2.07 mg/L

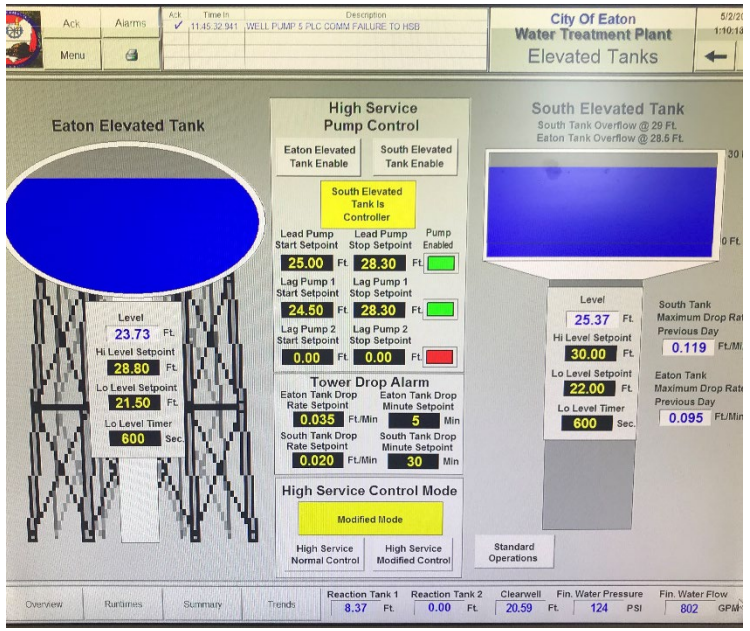


Future Challenges

- SCADA Upgrades
  - Currently monitoring a few processes on SCADA but need to add more







Future Challenges

- Equipment Aging and Failing
  - Pump and Valve Replacement
  - Rehab
    - Secondary Clarifiers
      - Concrete floor, drive unit, scum beach, bridge, troughs
    - Anaerobic Digesters
      - Heat exchangers, gas lines, tanks, covers
    - Oxidation Tower
      - Redwood media, walls, diffusers
    - Tertiary Filters
      - Control panels and filters

Questions