



# **An ESCO Story: Aeration Upgrades in Westfield MA Lead to Energy Savings and Improved Process Control**

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**Presentation Team**

**Cynthia Castellon**, Project Engineer, Tighe & Bond

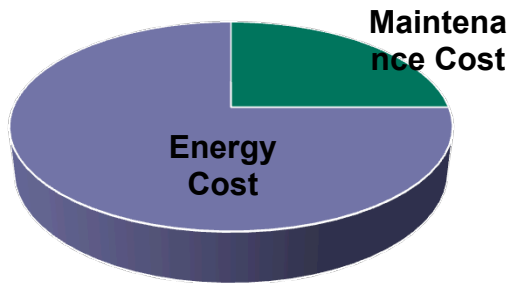
**Jeff Gamelli**, Deputy Superintendent, City of Westfield

# How can municipalities achieve energy savings and improve process control?

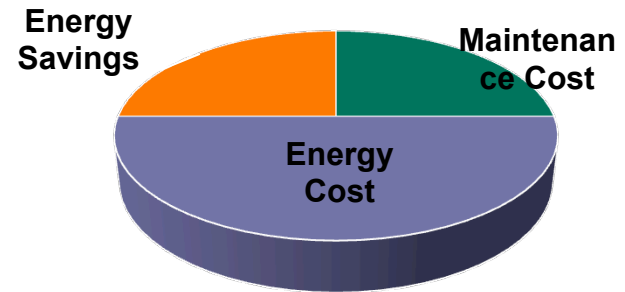
## ■ City and ESCO

- Entered into an energy management / maintenance contract → Innovative financing technique
- Retrofitted their aeration equipment and controls → Targeted large energy user

Operating Budget Before



Operating Budget After



# Design Capacity vs. Actual Conditions

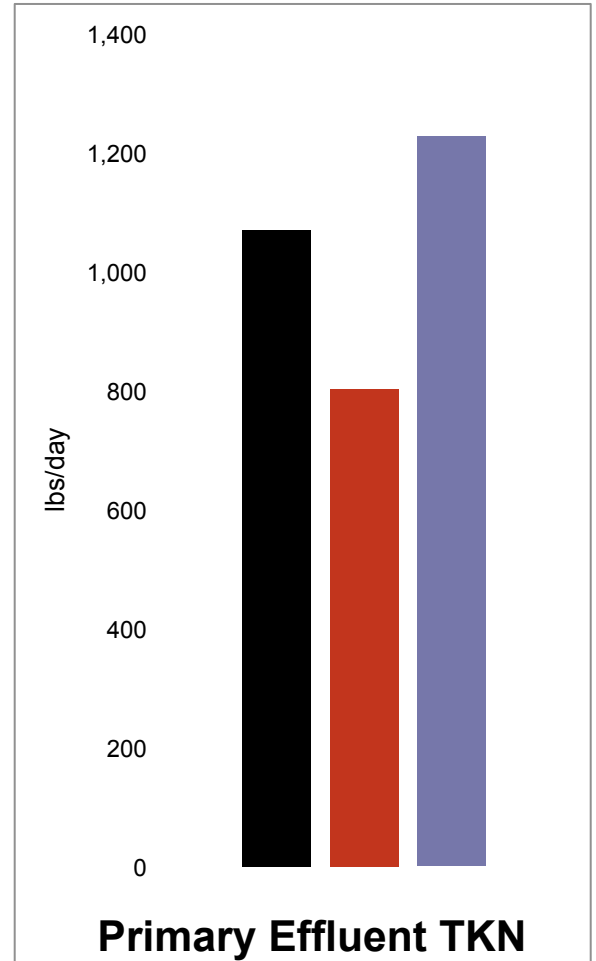
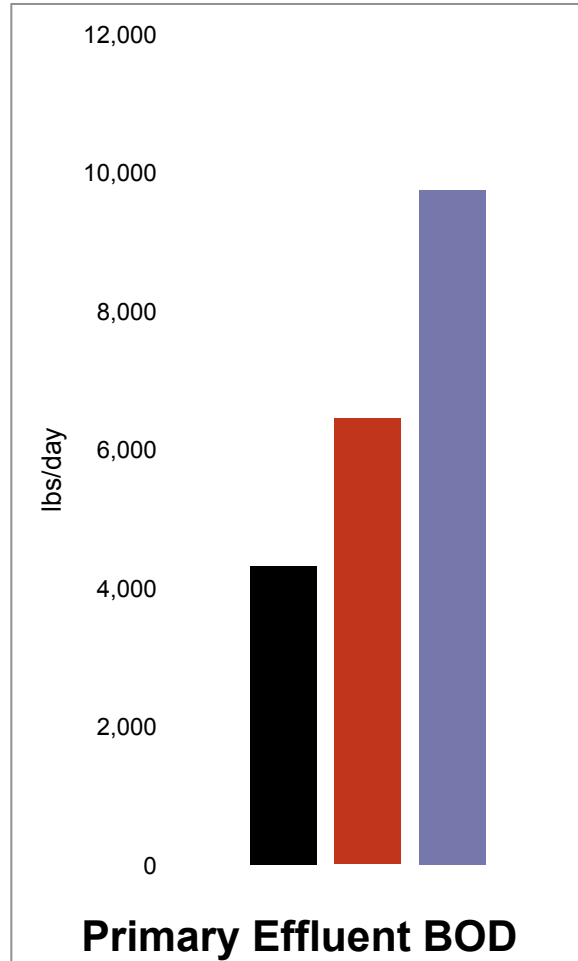
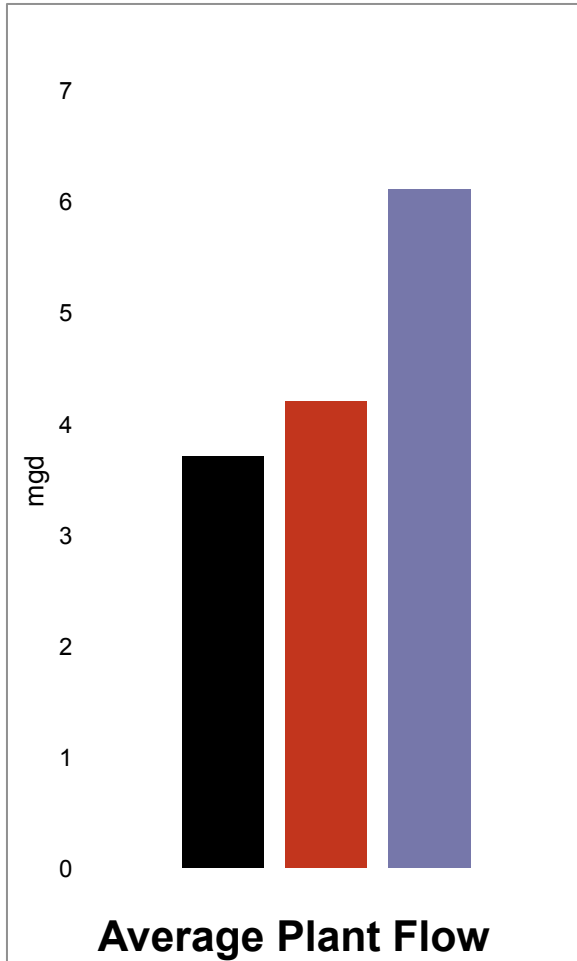


20-Year Future Design

Actual Conditions

# Water Recovery Facility 1972, 2002 Upgrade

■ Actual   ■ Initial Design Year (2001)   ■ Future Design Year (20-Yr)





Blower Building



Aeration Tanks



Westfield River

Westfield River

E Main St

# Turblex Single Stage, Radial Type Centrifugal Blowers



Two duty and one standby

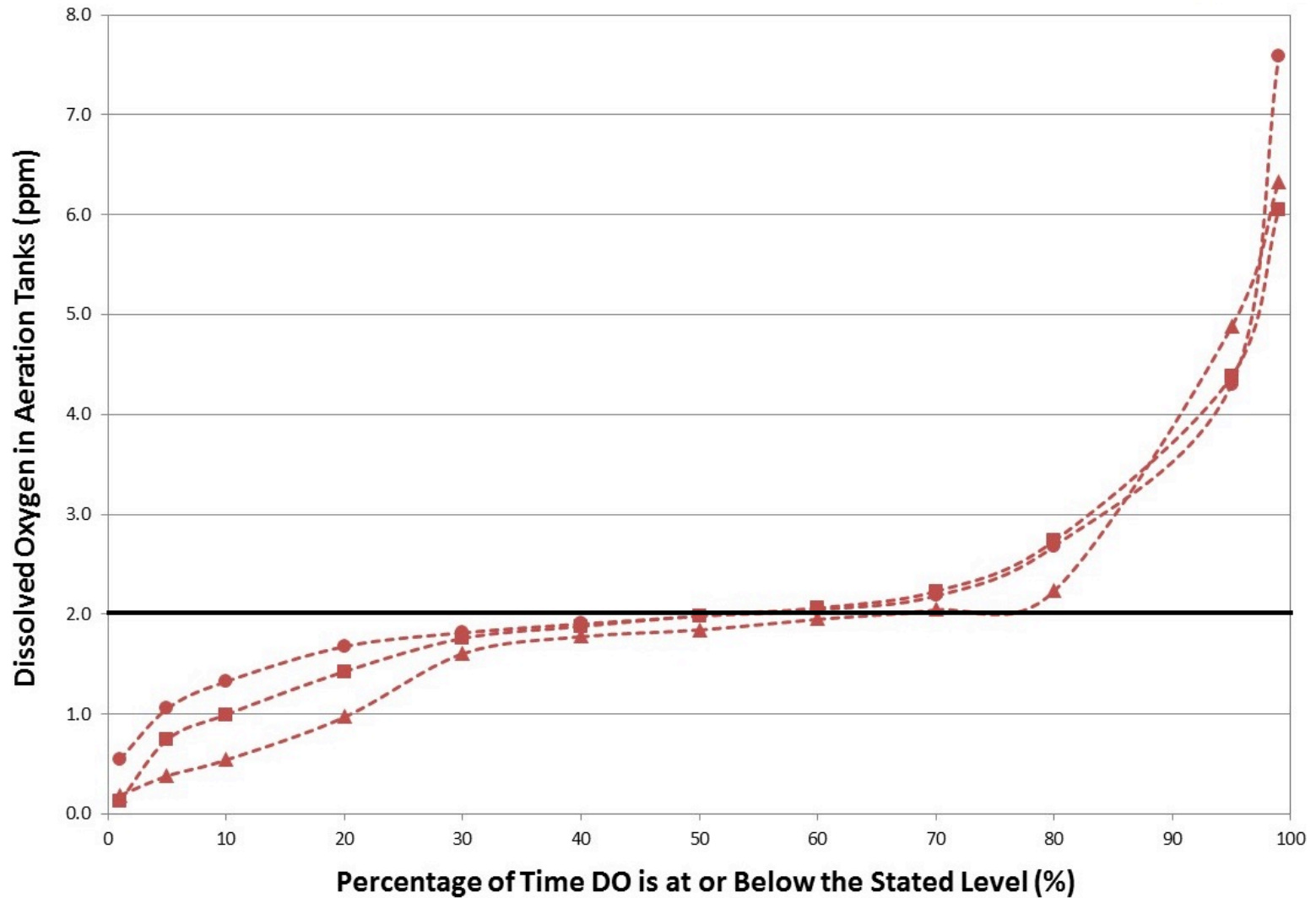
Sized for 20-year future plant capacity

200 hp

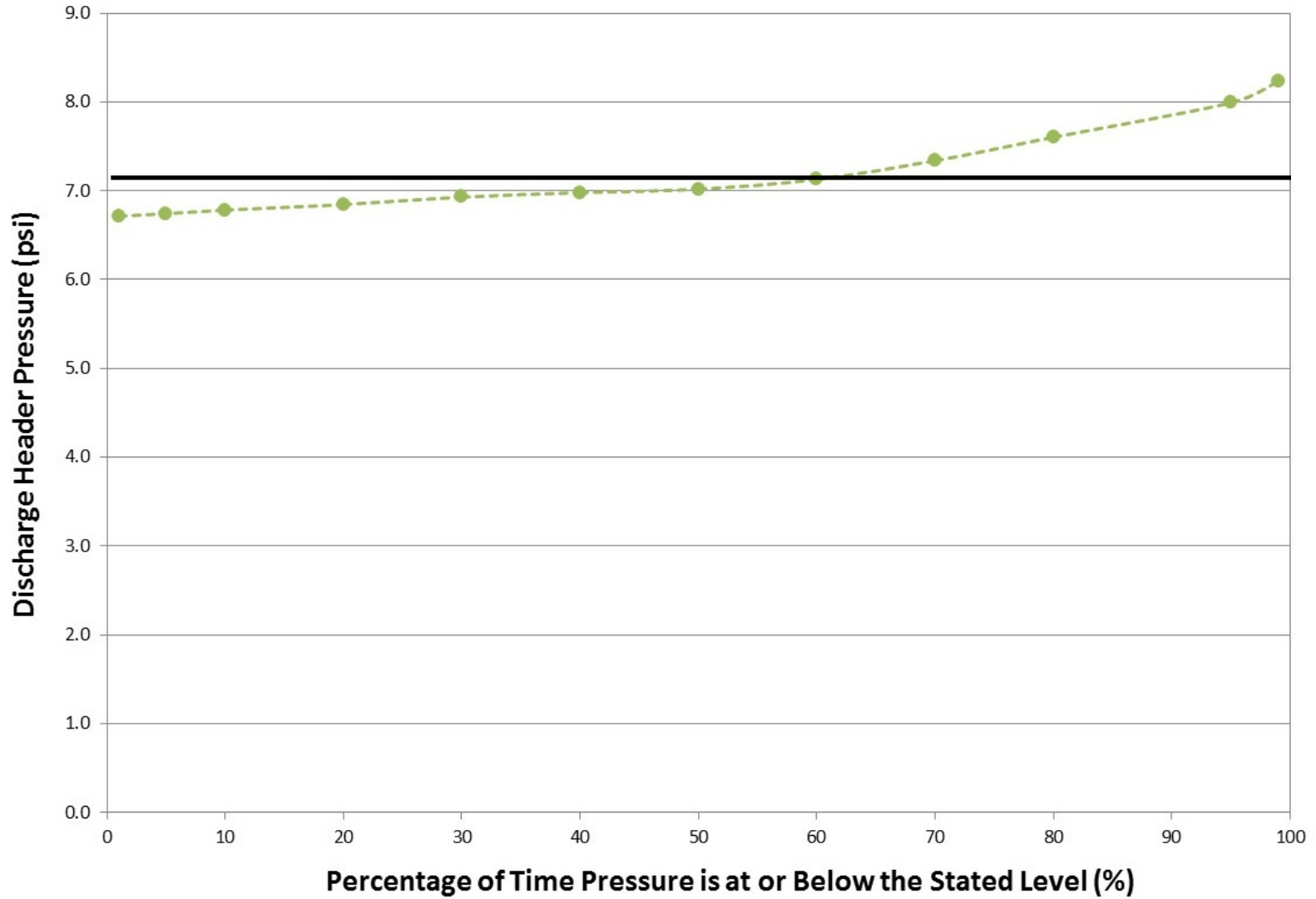
1,934 / 4,297 scfm per blower (2.2:1 turndown)

7.3 psia

# Dissolved Oxygen Levels Per Tank Pre-Retrofit



# Discharge Header Pressure Pre-Retrofit





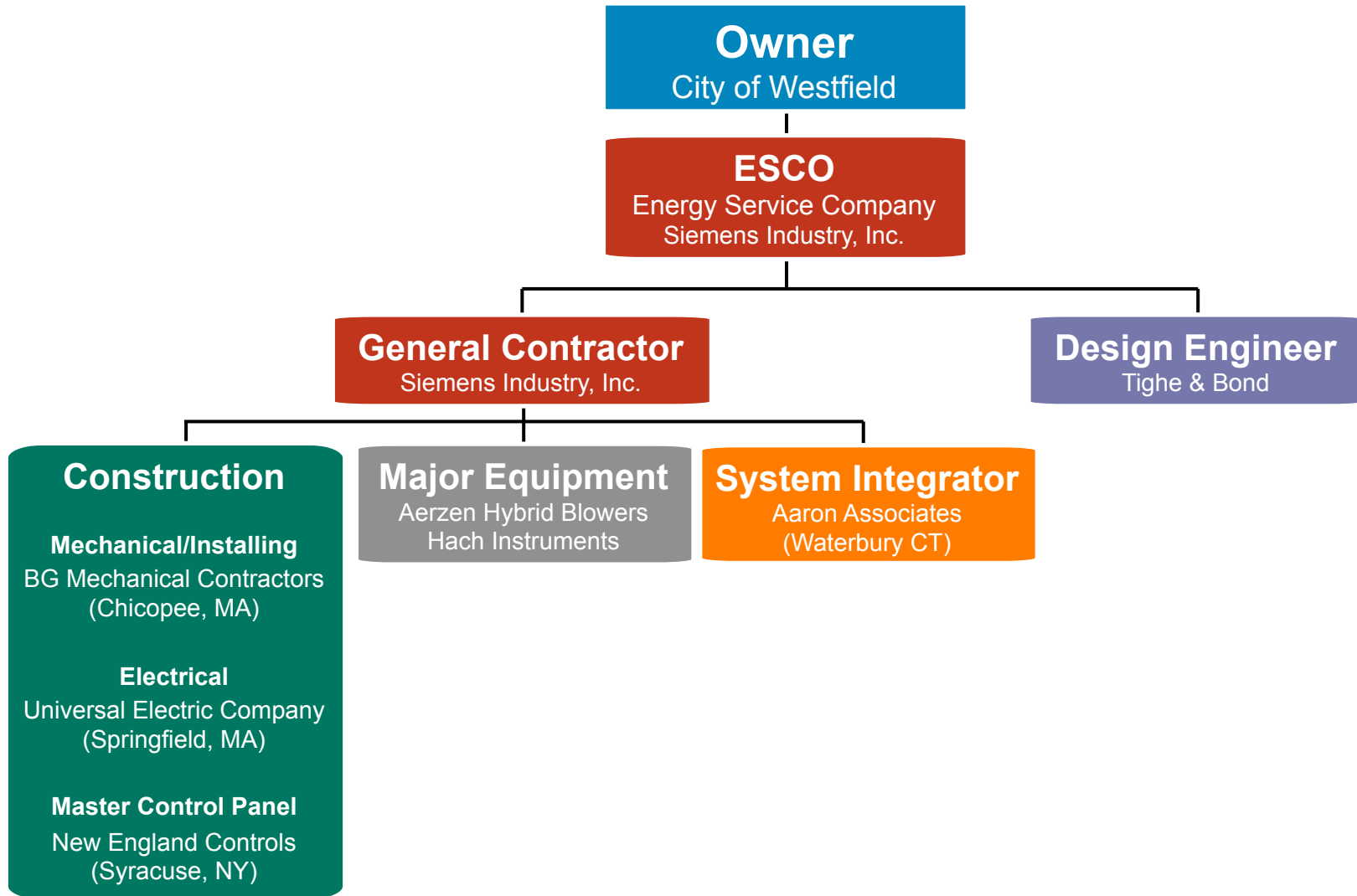
# Aeration Tanks Before



# Aeration Tanks Today



# Project Team



# Air Flow Analysis

## ■ Existing and Projected Air Requirements

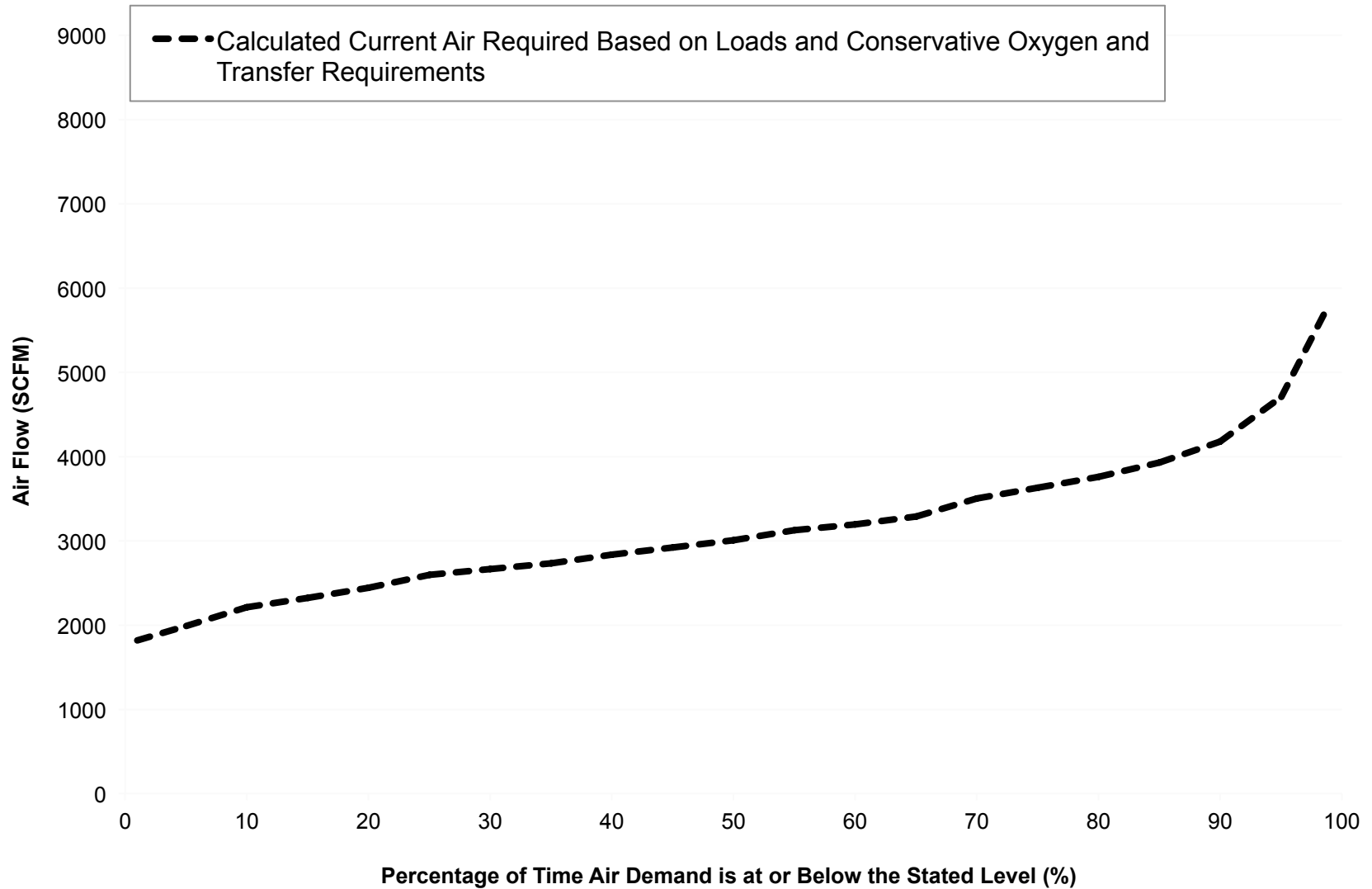
Proposed Blower Performance →

Design Airflows Based on  
Air Demand Model  
Calibrated to Site  
Conditions

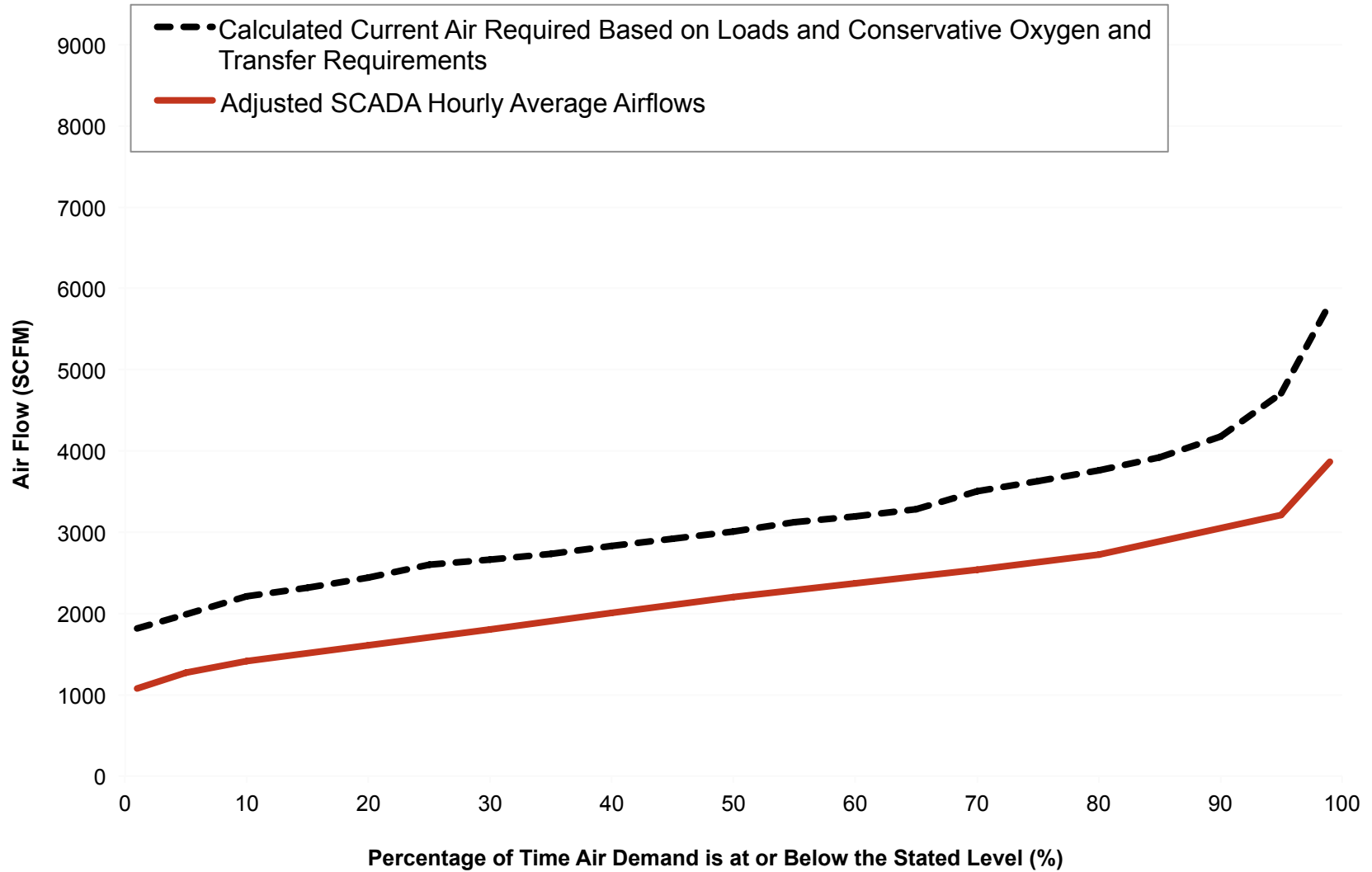
Current Blower Performance →

SCADA Hourly Average Air  
Flow Data

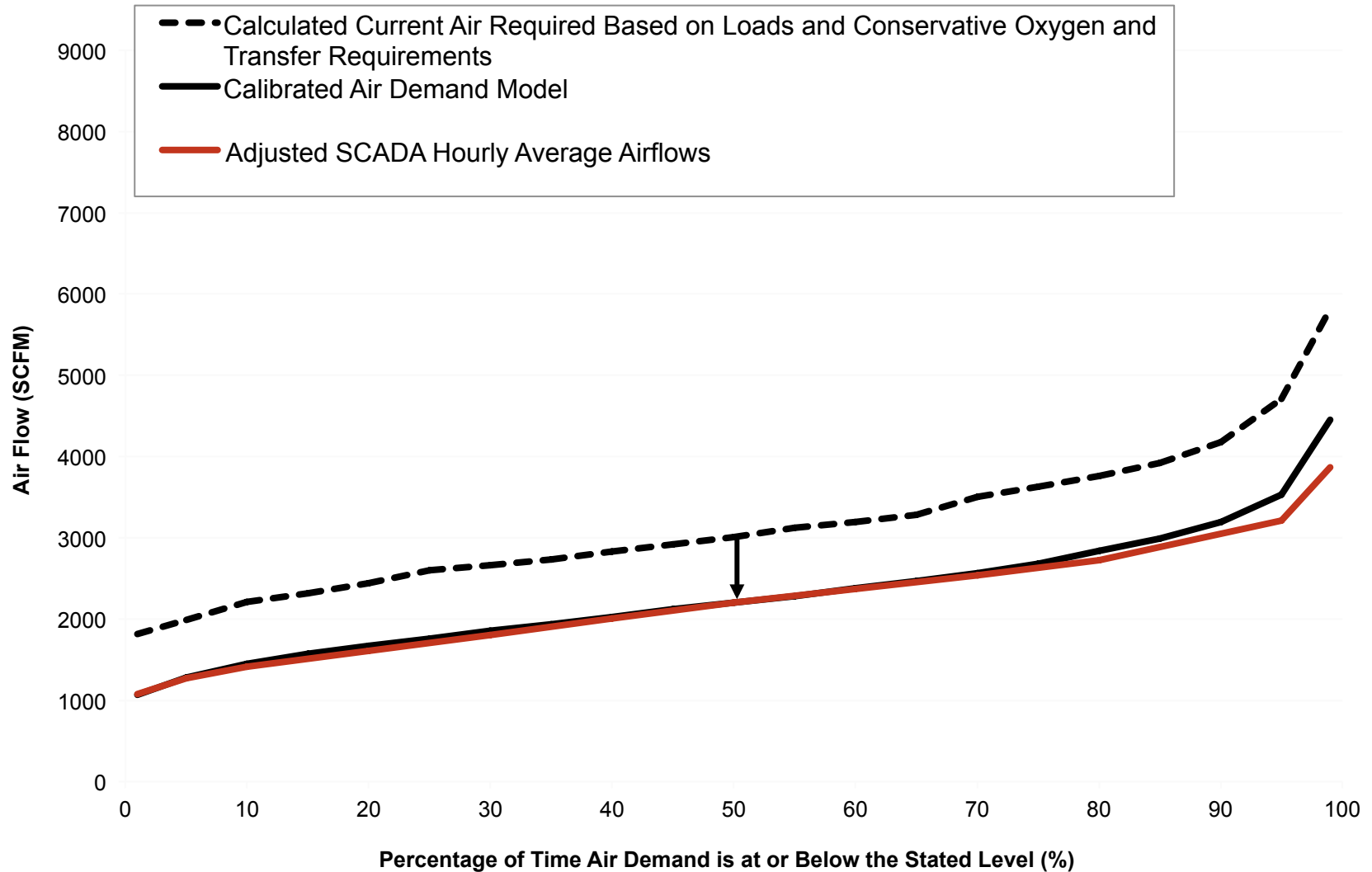
# Oxygen Demand Model for BOD & TKN Removal



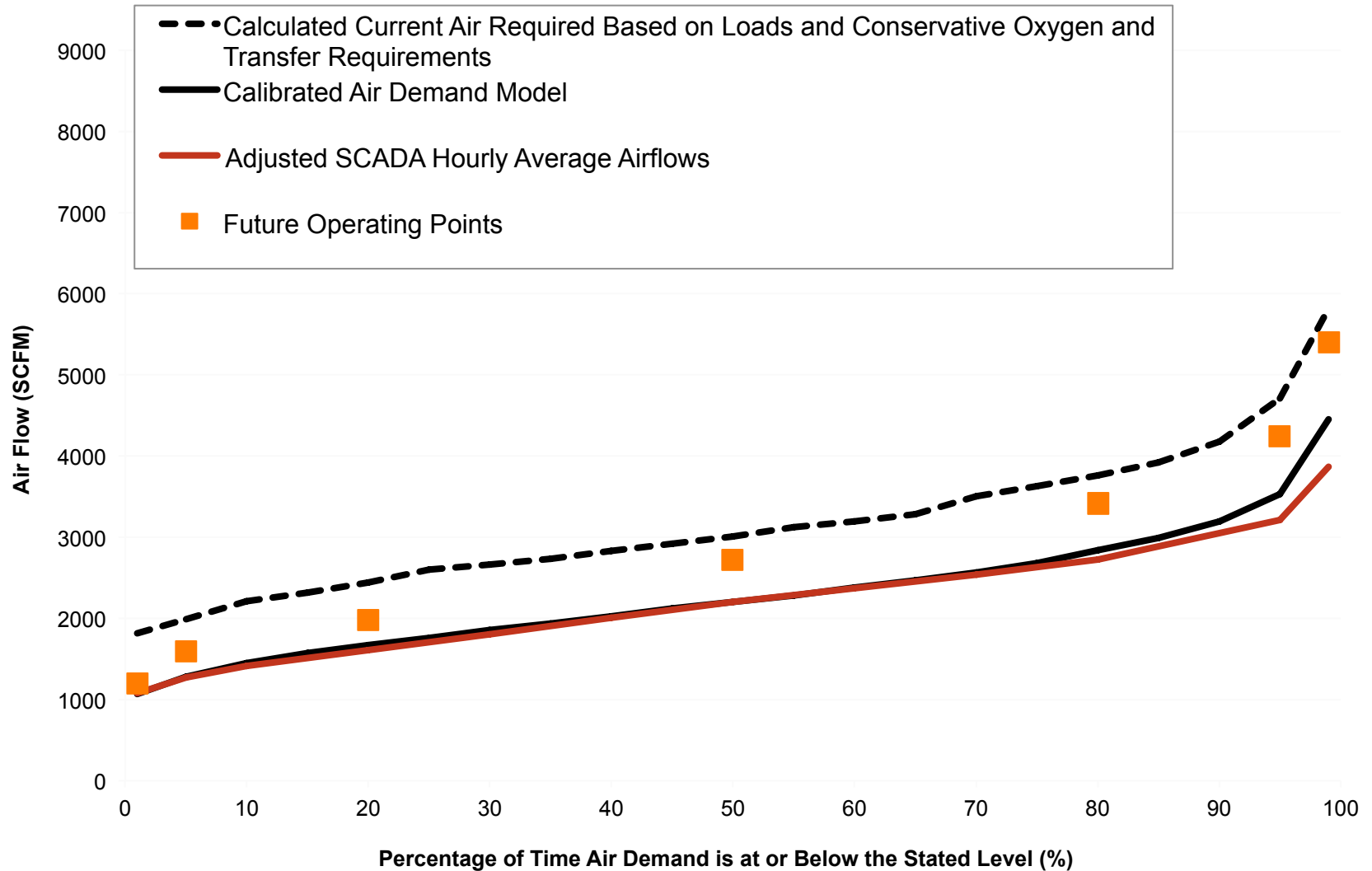
# Adjusted Historical Air Flow Demands



# Air Demand Model Calibrated to Site

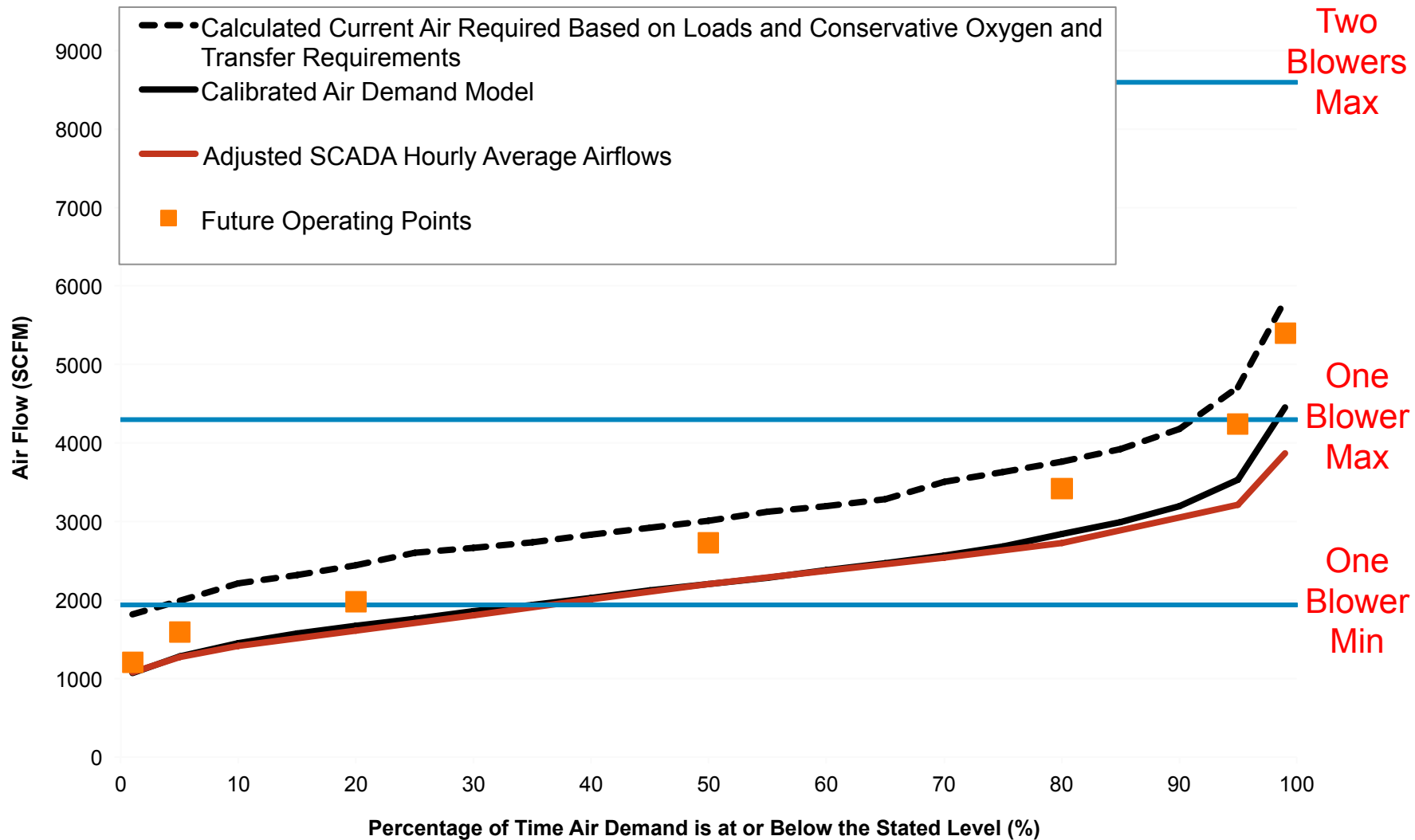


# Projected Airflows

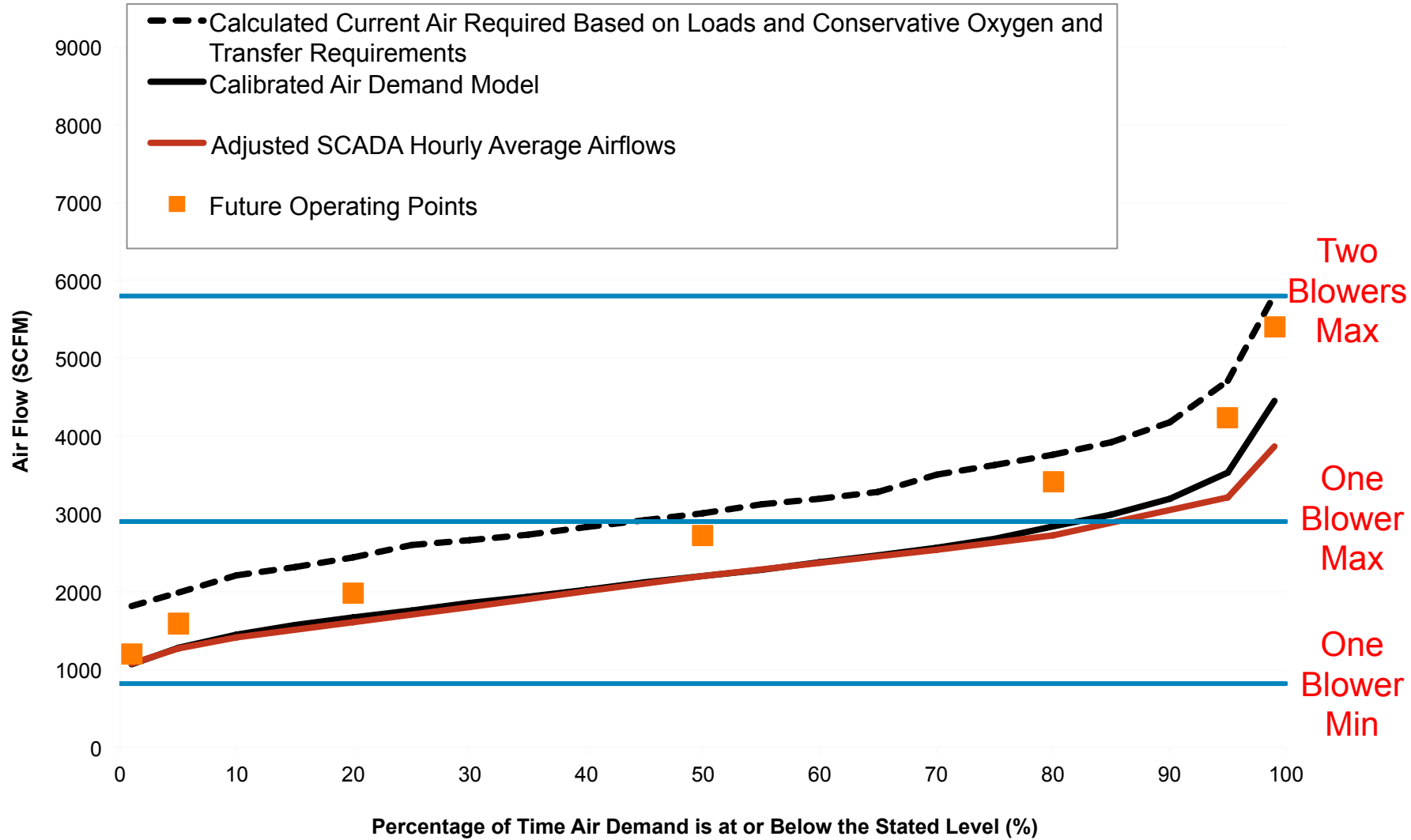




# Current Blower Performance



# Proposed Blower Performance



# Design Considerations

- **Space Available**
- **Odor Control Air**
  - Corrosion Resistant
  - Purge Cycle
- **Instrumentation**
- **Control Scheme**
  - Most Open Valve
- **Centrifugal vs. Positive Displacement Blower**



# Blower Equipment

## ■ Aerzen PD Rotary Screw Compressor

- D-Series Delta Hybrid
- 150 hp, VFDs
- 817 / 2,900 scfm (3.5:1)
- Two duty, one standby

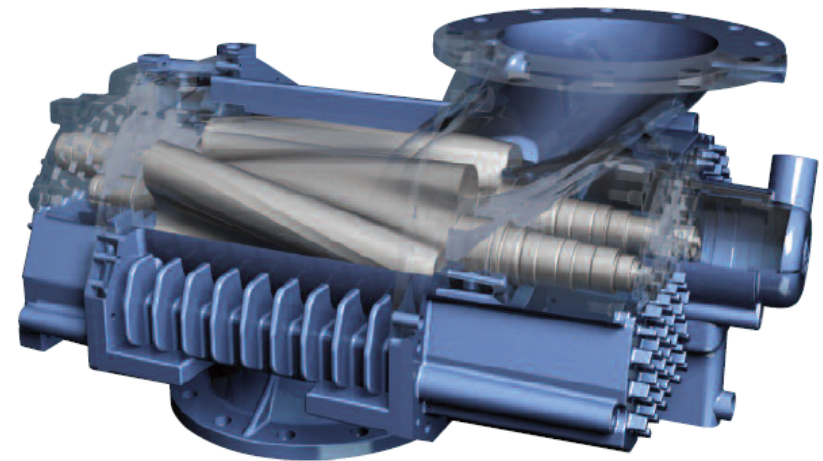
## Hybrid Rotary Compressor Stage



3+4 rotor profile with internal compression for low pressure applications.



3+3 rotor profile with twisted rotors and patented pulse charging as well as low squeeze losses.

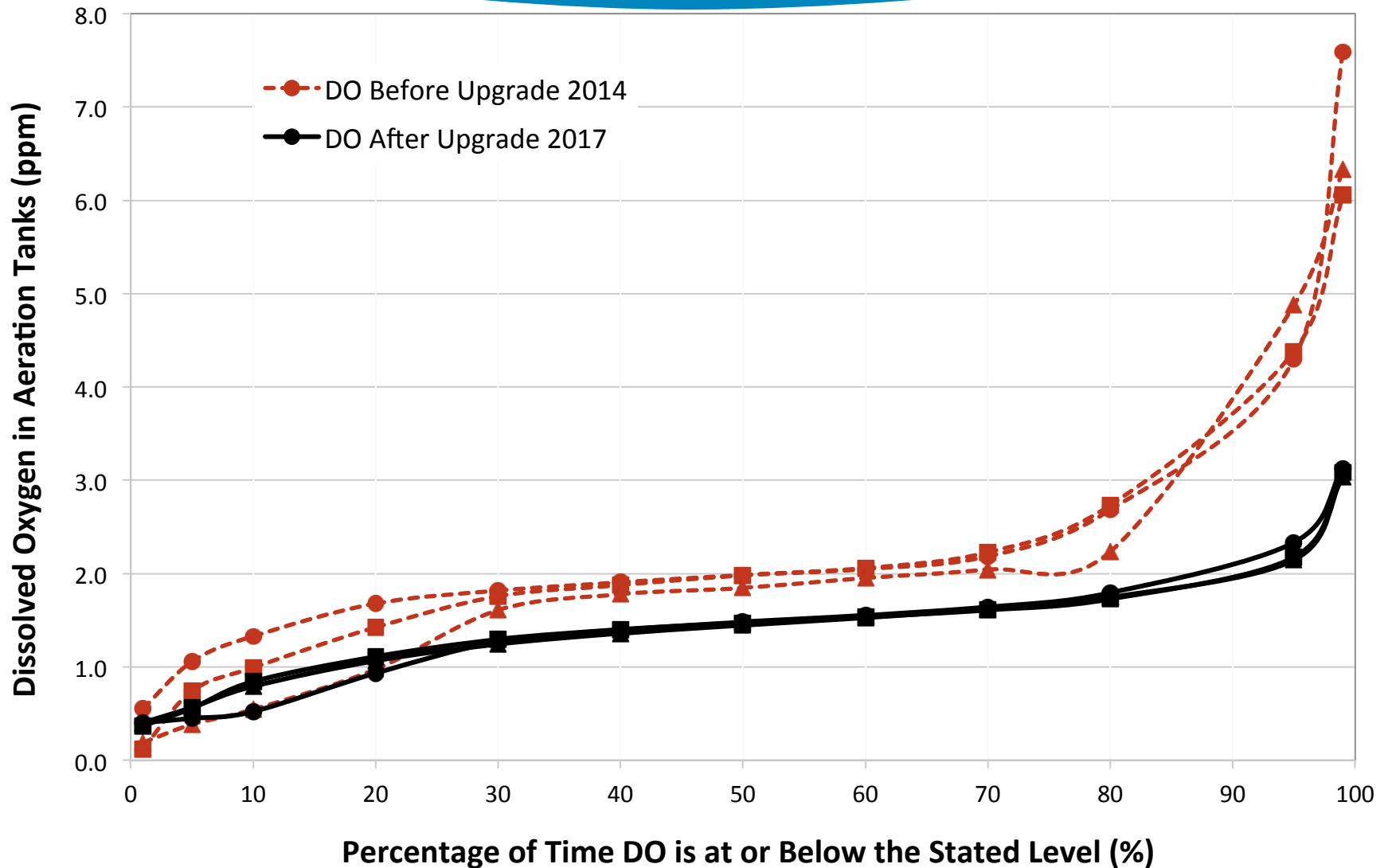


# Construction and Integration

- **Phased Install**
- **Manual Control, then Auto with MCP**
- **Initial PLC and HMI programming and startup**
- **Post project: TSS, NH<sub>4</sub>, ORP sensors and ammonia-based aeration controls**



# Dissolved Oxygen Comparison



# Energy Performance Contract

## ■ 20-Year Contract Term

## ■ Energy Conservation Measures at the WRRF

- Premium efficiency motors
- Blower upgrade
- AC upgrades
- Boilers and hot water heater upgrades

## ■ 1<sup>st</sup> Annual Period

- Guaranteed energy savings were realized (electricity plus natural gas)
- Excess savings

# Takeaways

- **Energy performance contracts can help Municipalities finance capital improvements**
- **Utilities can reduce their energy budget by focusing improvements on large energy users**
- **Design criteria should account for site conditions in addition to conservative design approaches**





# Questions

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**Jeff Gamelli**, Deputy Superintendent

Water Resource Recovery

City of Westfield

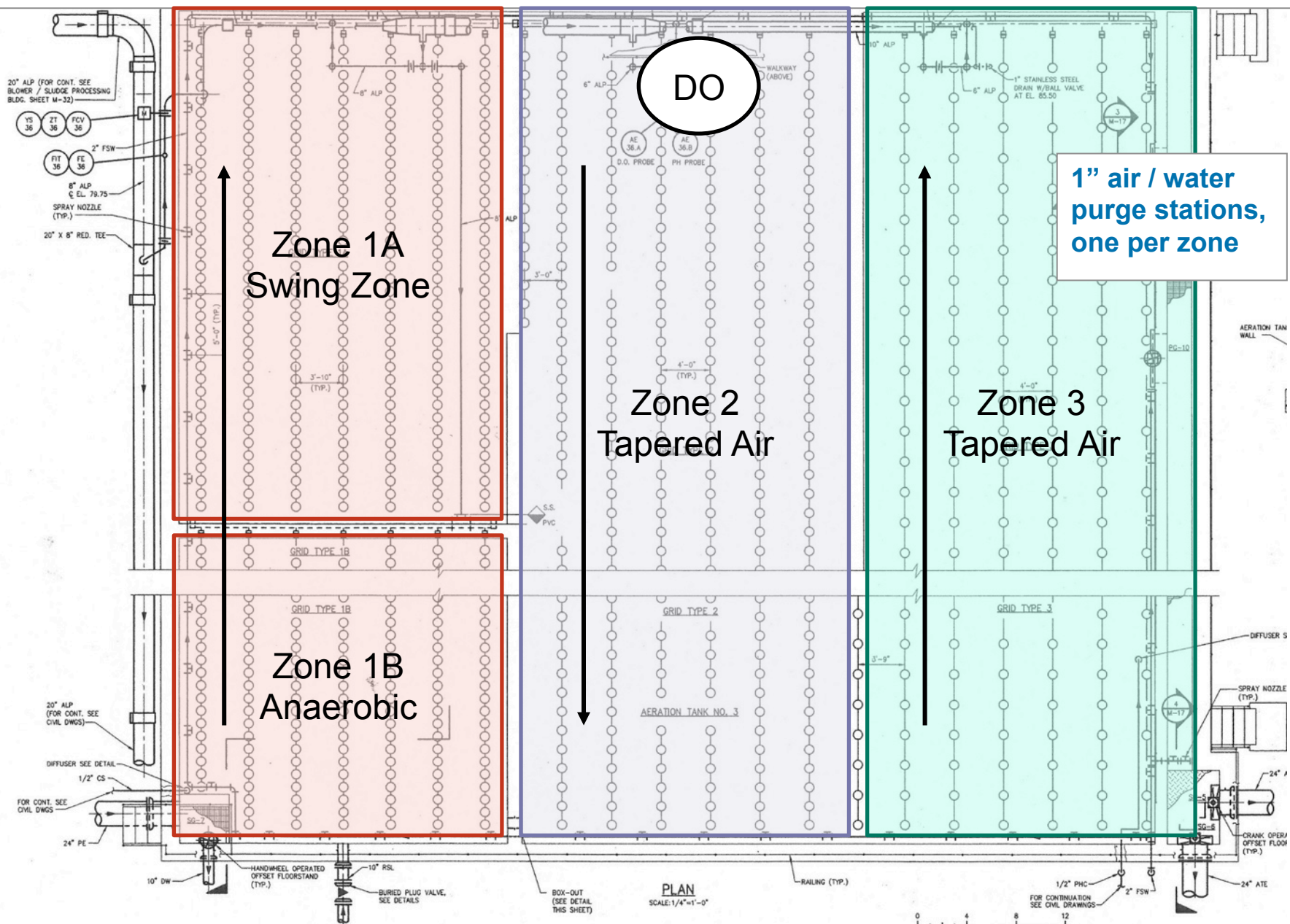
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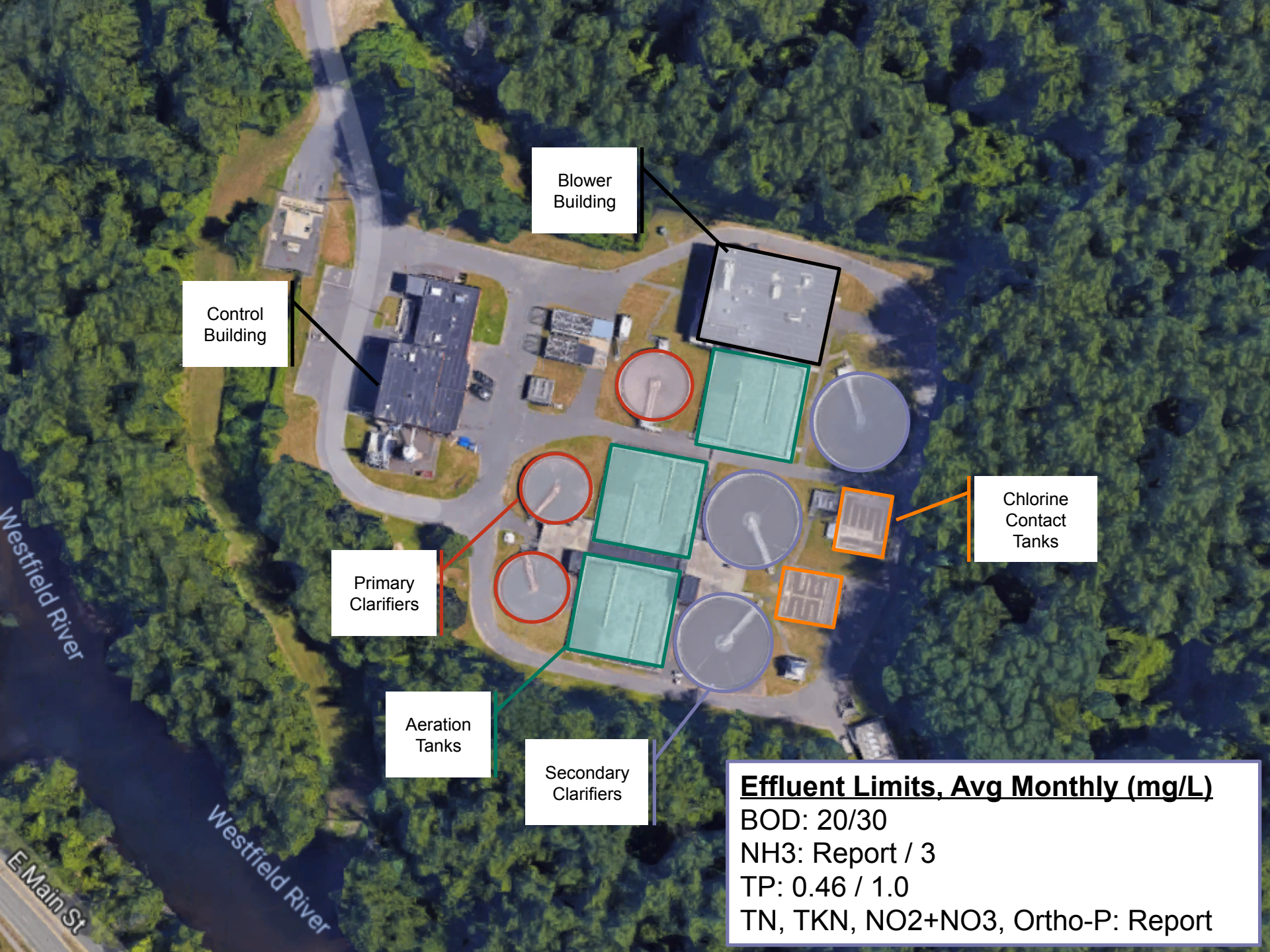




# Three Aeration Tanks



**1" air / water purge stations, one per zone**



Blower Building

Control Building

Chlorine Contact Tanks

Primary Clarifiers

Aeration Tanks

Secondary Clarifiers

**Effluent Limits, Avg Monthly (mg/L)**  
BOD: 20/30  
NH3: Report / 3  
TP: 0.46 / 1.0  
TN, TKN, NO2+NO3, Ortho-P: Report

Westfield River

Westfield River

E Main St