# TRADEWORKS ENVIRONMENTAL INC

ENVIROTECH 2022
APRIL 20-22

TRADEWORKS
ENVIRONMENTAL

Presented by: Dimitris Chrysochoou

# Bioaugmentation Application for Enhancing the Performance of an RBC Wastewater Treatment Plant and Improving Ammonia Removal

# RBC WWTP – AERIAL VIEW

- Design ADF: 4,546 m3
- Design Peak Flow: 14,320 m3
- Aerated Grit Removal
- Two (2) Primary Clarifiers
  - 4.5 hours retention time (avg)
  - 1.4 hours retention time (peak)
- Two (2) Secondary Clarifiers
  - 3.6 hours retention time (avg)
  - 1.1 hours retention time (peak)
- RBC: 2 Bays x 4 (8 RBC Shafts Total)
- Post Secondary Aeration (2 tanks)
  - 95 mins retention time (avg)
  - 30 mins retention time (peak)
- One (1) Secondary Anaerobic Digester
  - AD Volume 850m3

# MUNICIPAL RBC – CASE STUDY

## Application:

**Bioaugmentation** integrated into the collection system to enhance performance and avoid plant decommissioning

## Primary Objective:

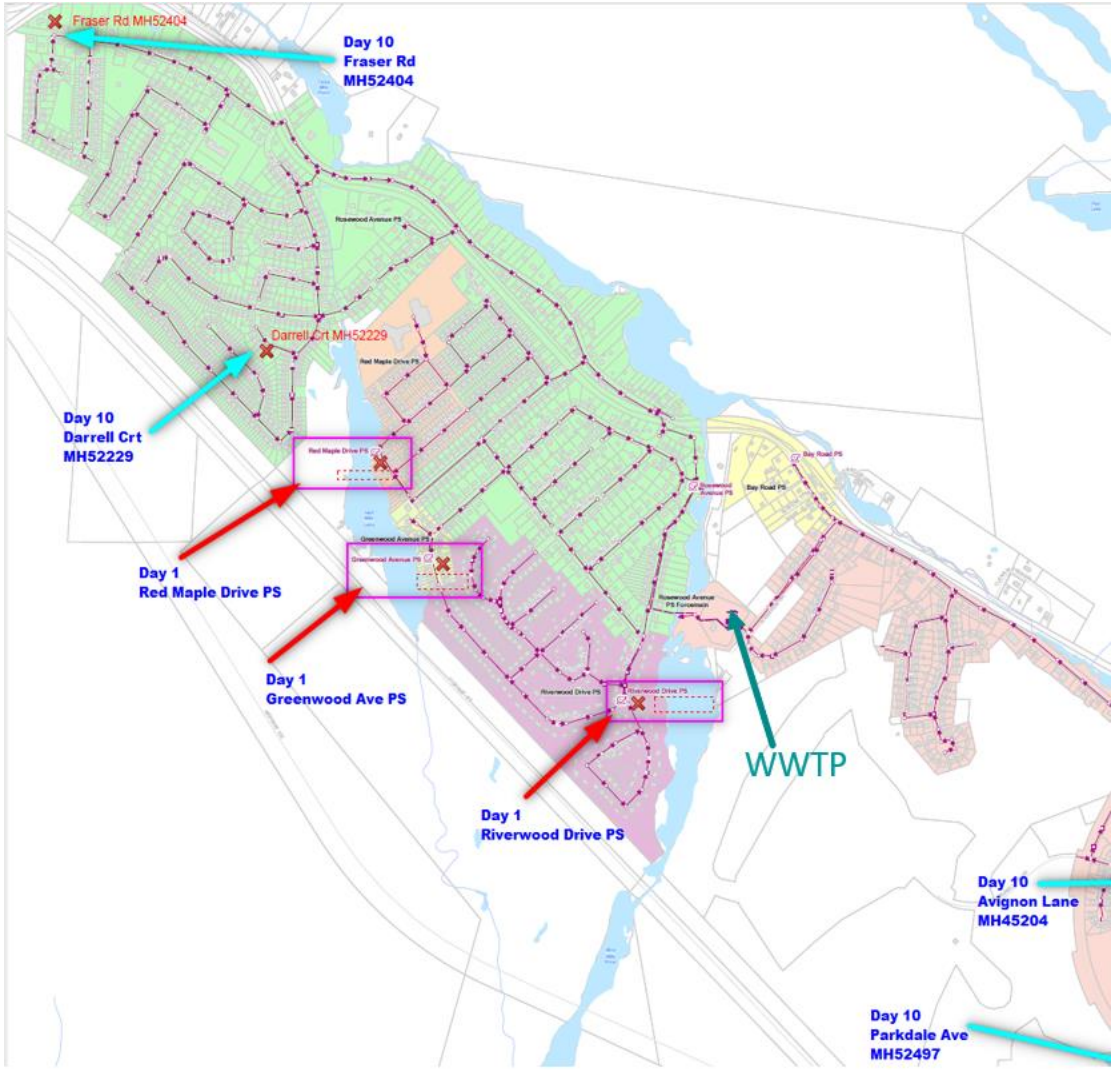
- Enhance nitrification to achieve compliance (varying climate conditions)

## Secondary Objectives:

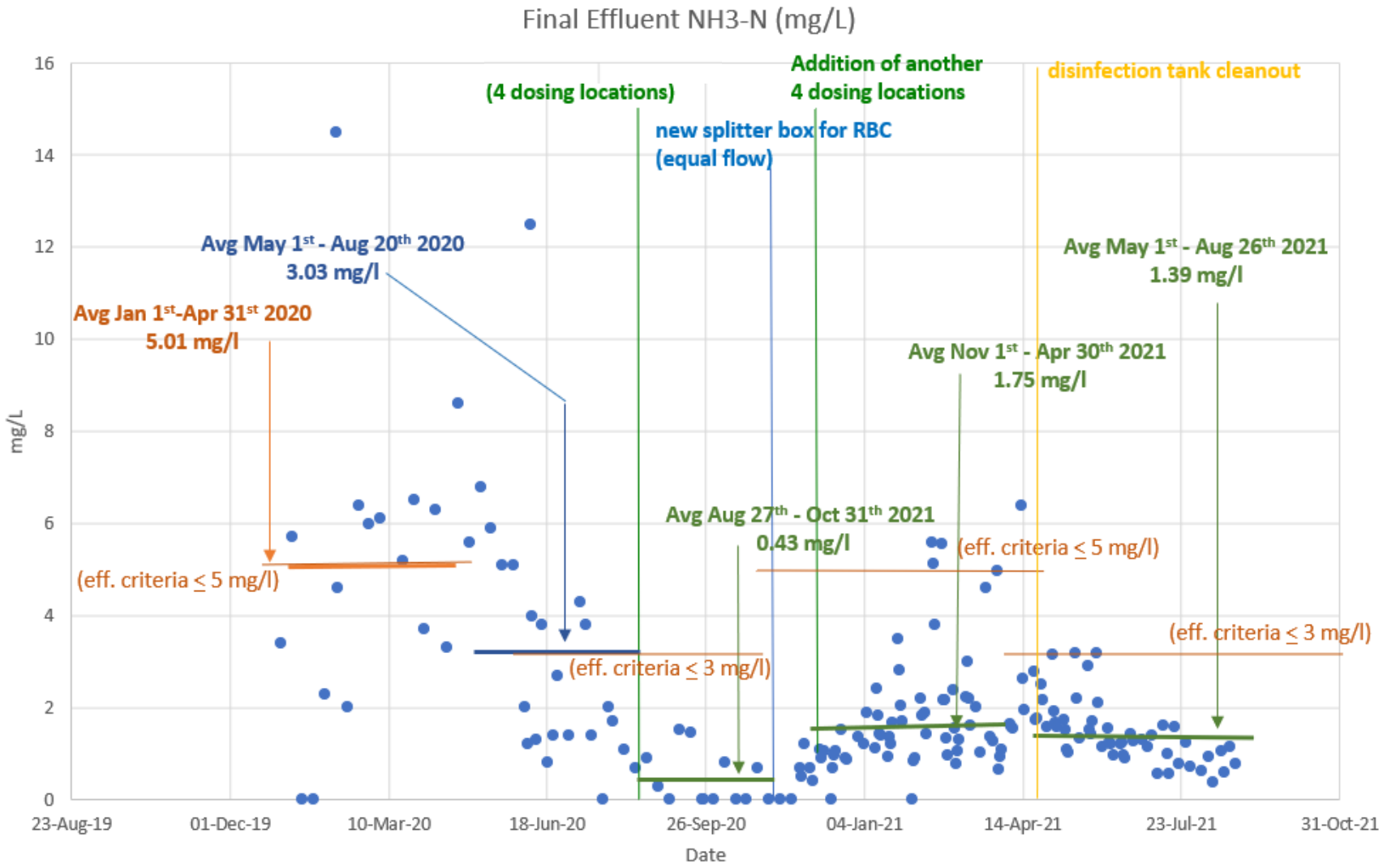
- Minimize odors and FOG in collection system
- Optimize wastewater treatment process
- Enhance biogas production in anaerobic digester
- Reduce sludge

## Results:

- Enhanced biological nutrient removal process
- Avoided decommissioning of the facility
- Technology is being expanded to other plants
- Bioaugmentation has become part of the standard operations

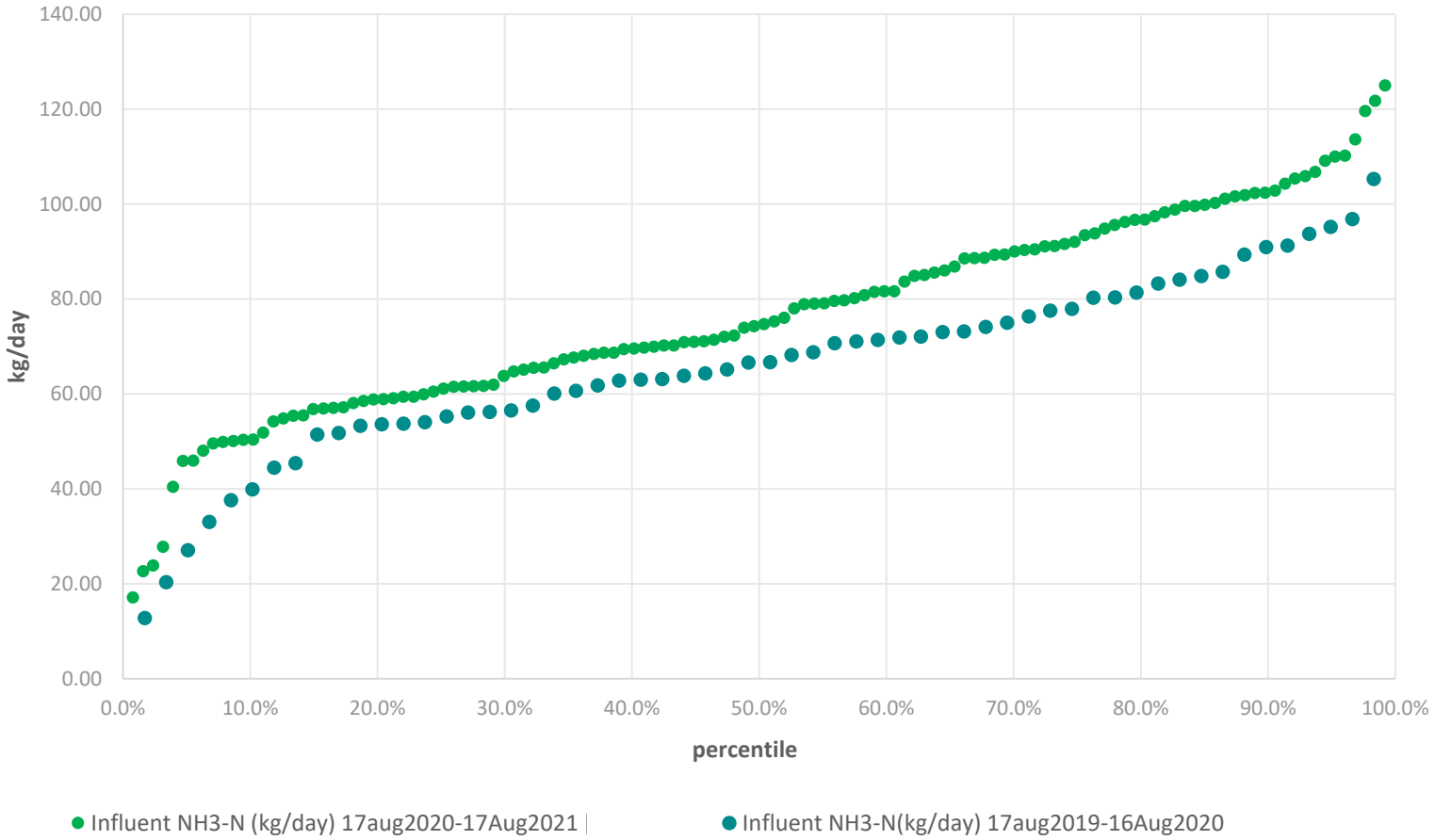


# MUNICIPAL RBC – FINAL EFFLUENT NH3-N (MG/L) BEFORE – AFTER BIOAUGMENTATION APPLICATION



# MUNICIPAL RBC – INFLUENT NH3-N ANALYSIS
# BIOAUGMENTATION APPLICATION MONTHS COMPARED TO SAME MONTHS PREVIOUS YEARS

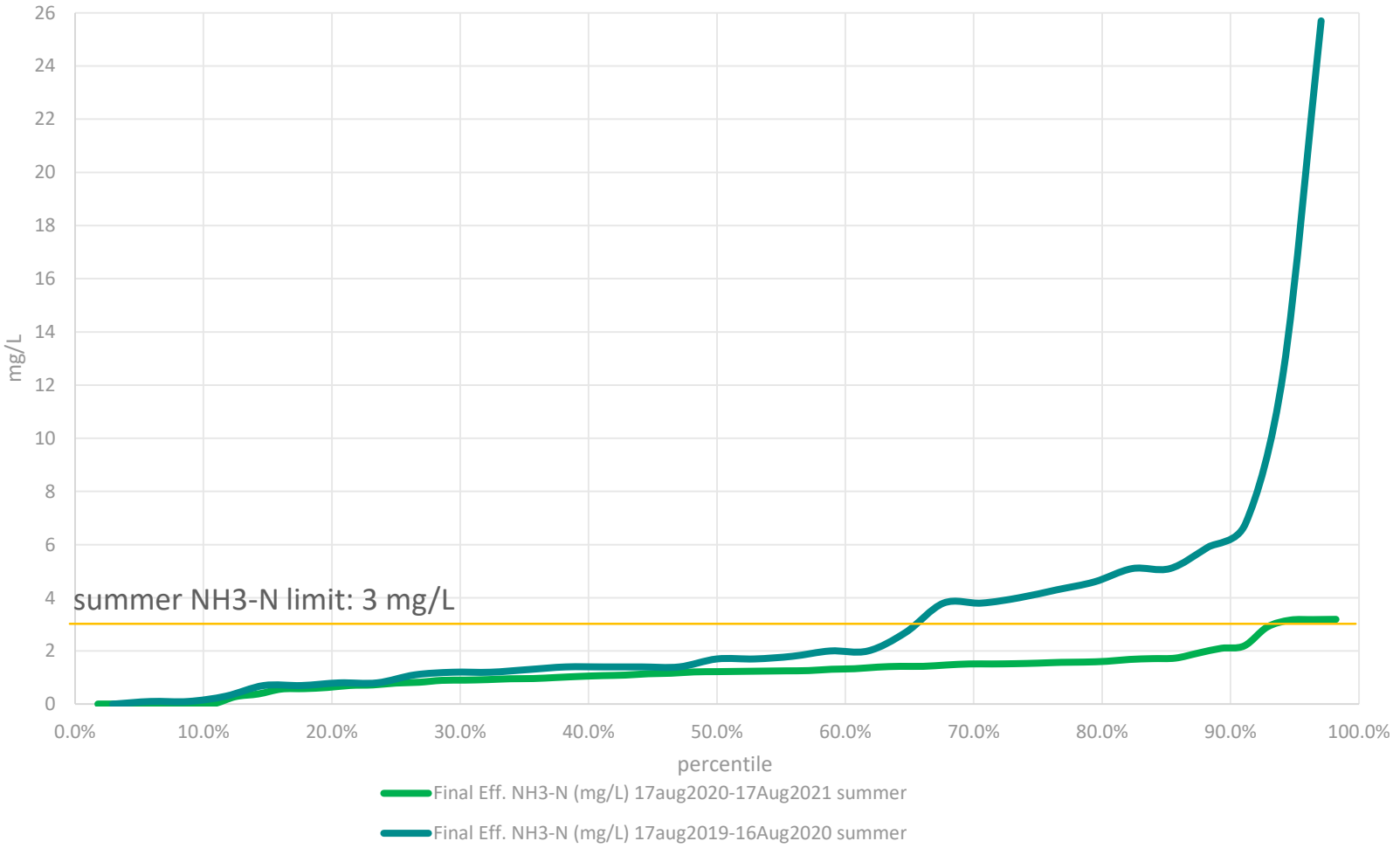
Influent Ammonia Loading [kg/day] Percentile Comparison Graph
1 year before vs 1 year with Bioaugmentation




| Percentile | Inf. NH3-N Loading [kg/day] 1 year ***before*** Bioaugmentation | Inf. NH3-N Loading [kg/day] 1 year ***after*** Bioaugmentation |
|---|---|---|
| 50th | 66.62 | 74.67 |
| 66th | 73.12 | 88.51 |
| 75th | 77.91 | 91.98 |
| 90th | 90.95 | 102.36 |
| 95th | 95.15 | 109.95 |

# MUNICIPAL RBC – EFFLUENT NH3-N ANALYSIS [1/2] – SUMMER PERIOD BIOAUGMENTATION APPLICATION MONTHS COMPARED TO SAME MONTHS PREVIOUS YEARS

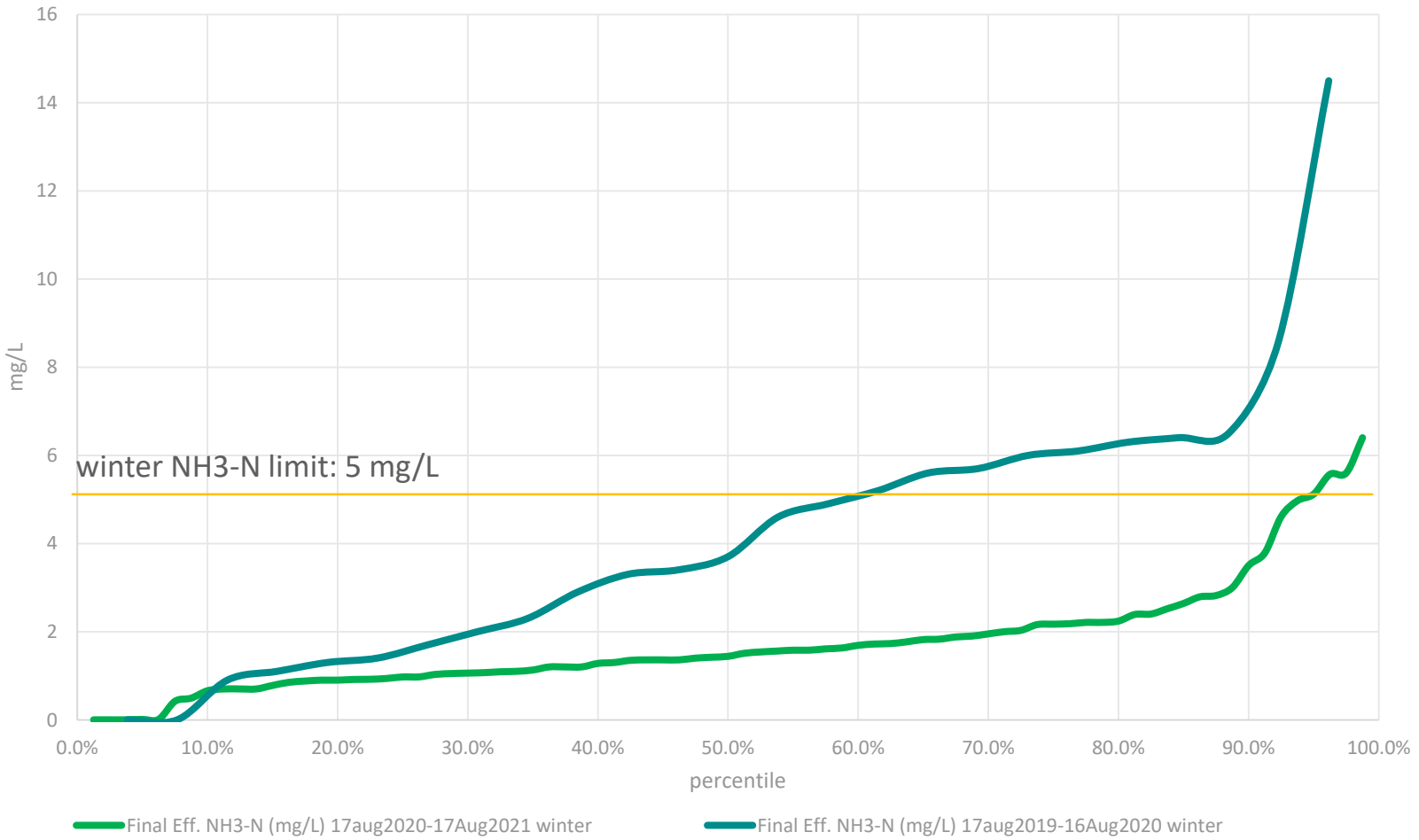
Final Effluent Ammonia [mg/L] Percentile Comparison Graph
1yr before vs 1yr after Bioaugmentation - summer data




| Percentile | Eff. NH3-N Conc. Summer period [mg/L] 1 year ***before*** Bioaugmentation | Eff. NH3-N Conc. Summer period [mg/L] 1 year ***after*** Bioaugmentation |
|---|---|---|
| 50th | 1.7 | 1.22 |
| 66th | 2.7 | 1.42 |
| 75th | 4.3 | 1.54 |
| 90th | 6.8 | 2.1 |
| 95th | 12.5 | 3.16 |

# MUNICIPAL RBC – EFFLUENT NH3-N ANALYSIS [2/2] – WINTER PERIOD
# BIOAUGMENTATION APPLICATION MONTHS COMPARED TO SAME MONTHS PREVIOUS YEARS

Final Effluent Ammonia [mg/L] Percentile Comparison Graph
1yr before vs 1yr after Bioaugmentation - winter data



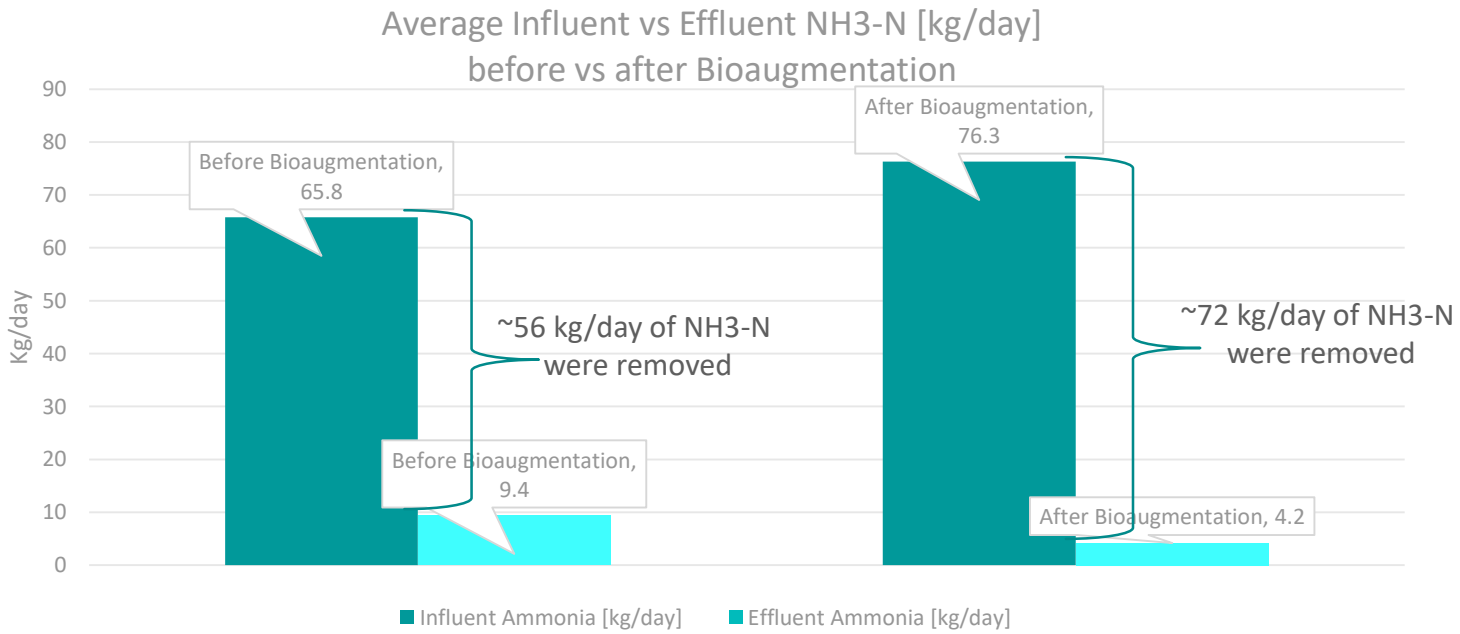

| Percentile | Eff. NH3-N Conc. Winter period [mg/L] 1 year ***before*** Bioaugmentation | Eff. NH3-N Conc. Winter period [mg/L] 1 year ***after*** Bioaugmentation |
|---|---|---|
| 50th | 3.7 | 1.44 |
| 66th | 5.6 | 1.83 |
| 75th | 6.1 | 2.17 |
| 90th | 6.5 | 4.97 |
| 95th | 14.5 | 5.12 |

# MUNICIPAL RBC – NH3-N SYSTEM REMOVAL ANALYSIS
# BIOAUGMENTATION APPLICATION MONTHS COMPARED TO SAME MONTHS PREVIOUS YEARS

- Before Bioaugmentation application, the system would remove on an average ~56 kg/day of NH3-N

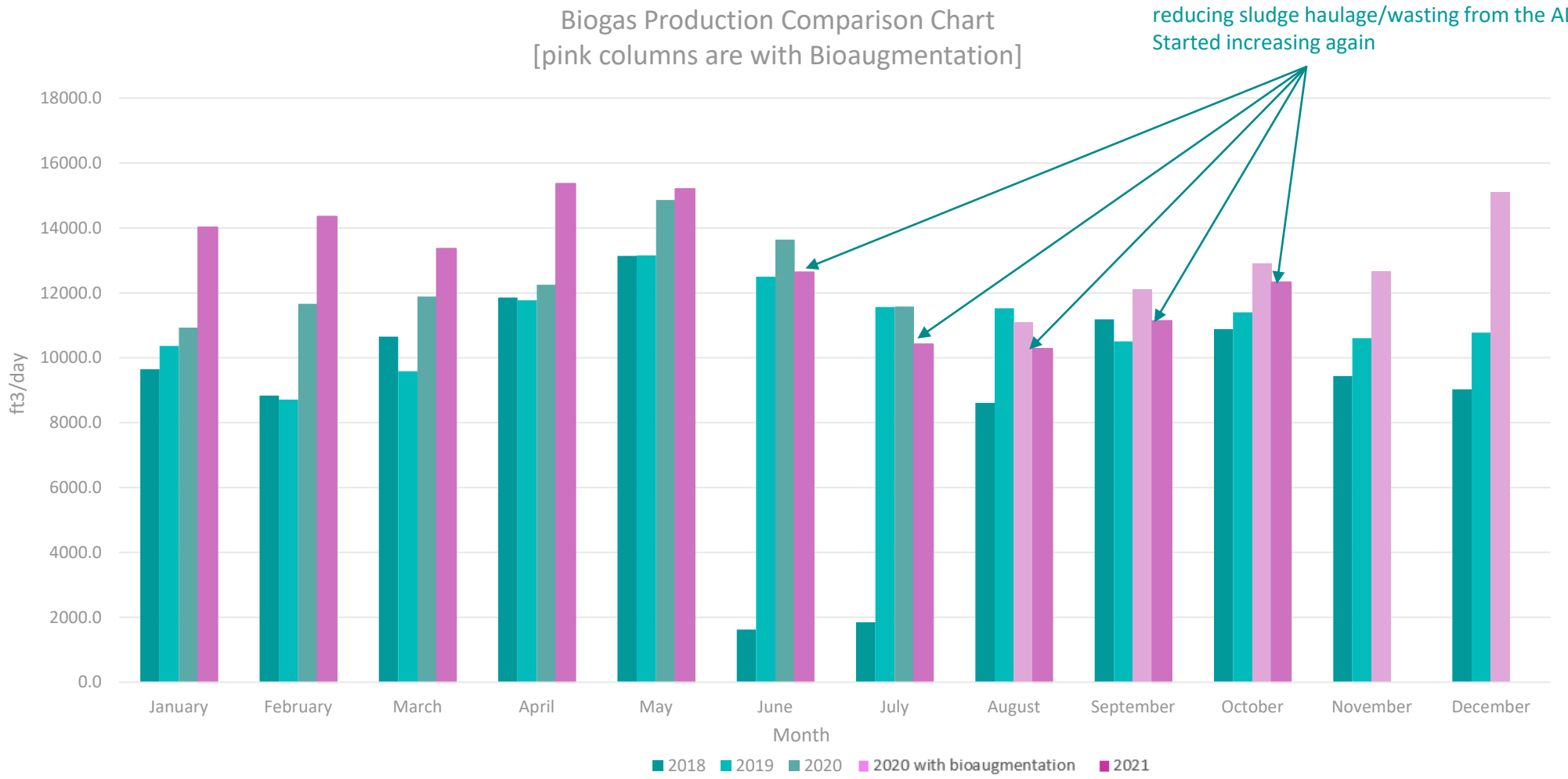
- After Bioaugmentation application, the system would remove on an average ~72 kg/day of NH3-N

***~28% increase in the Ammonia uptake of the system***

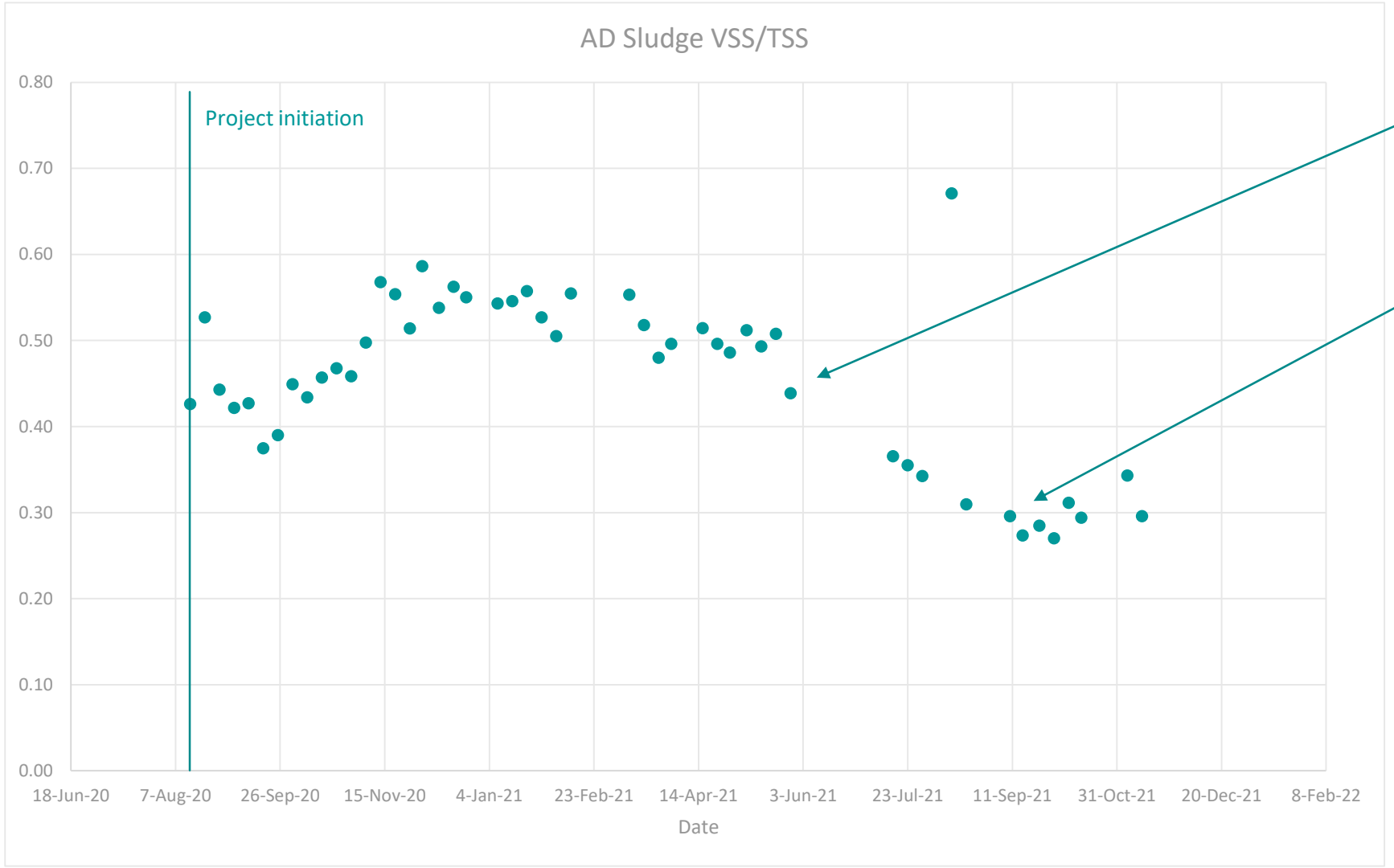


# MUNICIPAL RBC – BIOGAS PRODUCTION
# BIOAUGMENTATION APPLICATION MONTHS COMPARED TO SAME MONTHS PREVIOUS YEARS

Gas production started decreasing due to reduction in sludge inventory in the AD. In September, we started reducing sludge haulage/wasting from the AD, and biogas Started increasing again



# MUNICIPAL RBC – ANAEROBIC DIGESTER DATA AFTER BIOAUGMENTATION




Increase in biodegradation due to Bioaugmentation enables greater VSS destruction

Started reducing sludge hauling/wasting from the AD reactor

# MUNICIPAL RBC – PUMPING STATION FOG DEGRADATION

PS
15 Jan 2021

PS
29 Jan 2021

PS
5 May 2021

PS
16 Jul 2021

# MUNICIPAL RBC WWTF - H2S METER READINGS IN THE LIFT STATIONS [1/2]



$H_2S$ meter indicates no detectable $H_2S$

# MUNICIPAL RBC WWTF - H2S METER READINGS IN THE LIFT STATIONS [2/2]




$H_2S$ meter indicates no detectable $H_2S$ in various locations in the sewer system

# OVERALL CONCLUSION

- System optimization with the use of biotechnology
    - Enhance biological nutrient removal [Ammonia removal]
    - Increase in biogas production
    - Reduction in excess sludge
- Leveraging the existing infrastructure to enhance performance and efficiency
- The use of new innovative biotechnologies can play a key role in promoting alternative sustainable solutions

THANK YOU

**Dimitris Chrysochoou**

Technical Specialist

- T: 905.366.7660
- C: 416.905.9193
- F: 866.529.8497

dimitris@tradeworksinc.com

www.tradeworksinc.com

TRADEWORKS
ENVIRONMENTAL

*"Educating the mind without educating the heart is no education at all." - Aristotle*


TRADEWORKS
ENVIRONMENTAL