
Phosphorus Removal Strategy
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2023
INDIANAPOLIS
FIVE CITIES PLUS

Objectives

Evolution of Phosphorus NPDES Permit Limit

- Chemical Phosphorus Removal performances
- Biological Phosphorus Removal Evaluation

Impact from Lead & Copper Rule

- Citizens Water's implementation of corrosion protection
- Ortho phosphate utilization

Evolution of Phosphorus NPDES Permit Limit

- Belmont and Southport AWT Plants had a report only requirement for Total Phosphorus until 2018.
- In 2018, a permit limit of 1.0 mg/L total phosphorus was given to both AWT plants.
- Citizens Energy Group was granted a 3-year compliance plan in 2018.
- The 2023 NPDES permit limit is expected to remain at a monthly average of 1.0 mg/l total phosphorous.

Chemical Phosphorus Removal Performances

Belmont AWT Plant

- Chemical- Ferrous Chloride
- Dosing Points
  - Raw Sewage Influent; original intent as odor control
  - ANS Influent

Southport AWT Plant

- Chemical- Ferrous Chloride
- Dosing Points
  - Raw Sewage Influent; original intent as odor control
  - Mixed Liquor Channel

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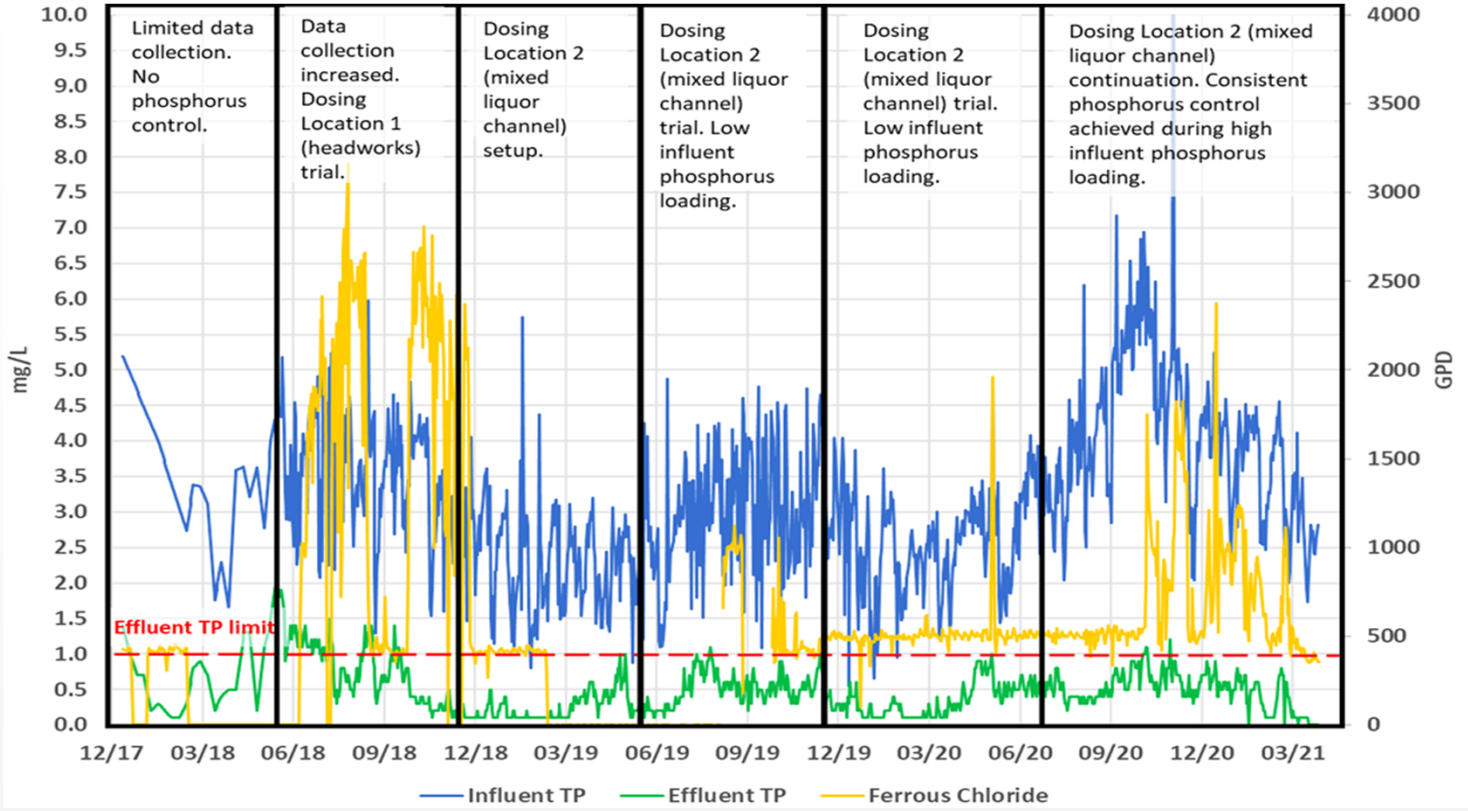
Chemical Phosphorus Treatment - Southport



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Lead & Copper Rule Impacts

Purpose:

- Protect public health by minimizing lead (Pb) and copper (Cu) levels in drinking water, primarily by reducing water corrosivity. Pb and Cu enter drinking water mainly from corrosion of Pb and Cu containing plumbing materials.

Description:

- Establishes action level (AL) of 0.015 mg/L for Pb and 1.3 mg/L for Cu based on 90th percentile level of tap water samples. An AL exceedance is not a violation but can trigger other requirements that include water quality parameter (WQP) monitoring, corrosion control treatment (CCT), source water monitoring/treatment, public education, and lead service line replacement (LSLR).

Citizens Water's Corrosion Protection Implementation

Coupon testing conducted by Virginia Tech

- Results highly variable due to coupon test protocol
- Zinc Orthophosphate indicated improvement
- Orthophosphate results mixed

Water Quality Data Review

- Orthophosphate dose at 2 to 4 mg/l (0.75 – 1.25 mg/L at P) is expected to achieve 90th percentile

Many utilities moving to orthophosphate addition:

- Ft. Wayne, Denver, Pittsburg, Edmonton, Providence, etc.

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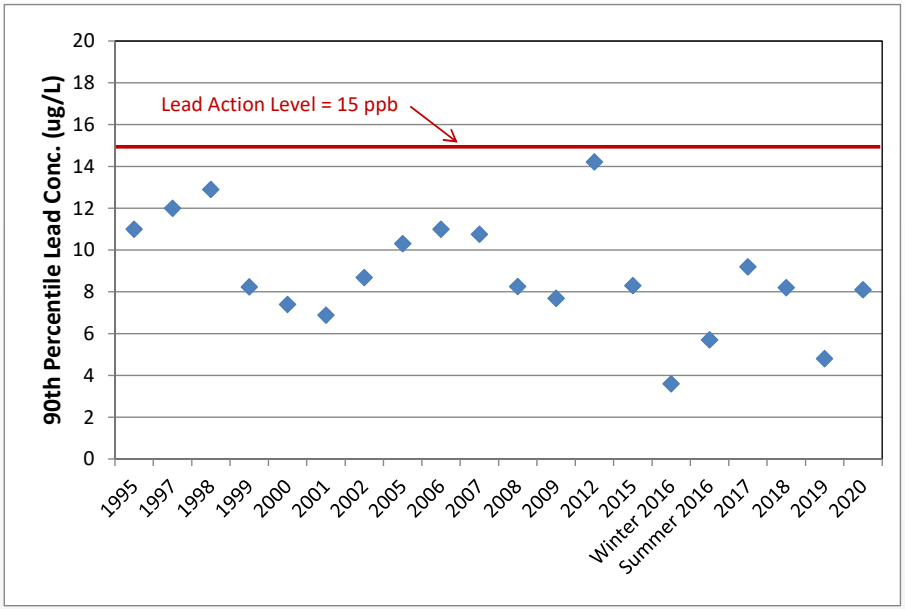
Citizens Water's Corrosion Protection – Current Situation

- Long Compliance History
- Corrosion Control Treatment: pH & alkalinity control
- Tap Sample Results:



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Citizens Water's Corrosion Inhibitor Use – Ortho Phosphate

- Citizens Water has 4 surface and 5 groundwater water treatment plants
- Several of these water plants have corrosion inhibitor capital planning in place
- The expected impact from orthophosphate dosing to Belmont and Southport AWT plants

Plant Air Nitrification System – Belmont AWT

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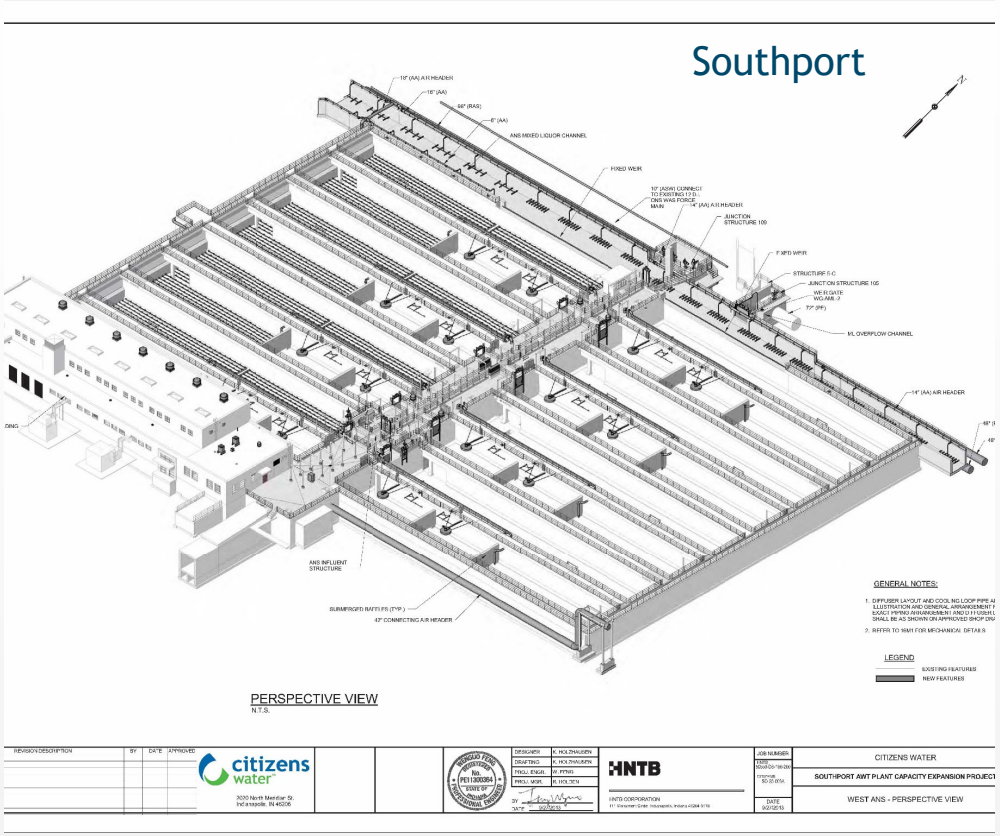
Plant Air Nitrification System – Southport AWT



- In-series Air Nitrification systems at Belmont and Southport AWT plants
- Designed for energy efficiency through total nitrogen reduction
- Includes step feed, anoxic and swing zones

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Biological Phosphorus Removal Evaluation

Current Phosphorus limit at 1.0 mg/L.

Total nitrogen report only for latest permit

Dosing of orthophosphate at Citizens' water treatment facilities for the Lead and Copper rule may increase WWTP phosphorus loading by 450 lbs/day.

With similar configurations of in-series ANS at Belmont and Southport plants, Citizens starts the evaluation of biological P-removal potential using existing infrastructures and effects on total nitrogen reduction as well.

EBPR Evaluation

- ANS modifications to convert portion of aerobic zone into an anoxic/ anaerobic swing zone.
- Evaluate substrates (CBOD, VFAs, RBD) to both plants
- Conduct special sampling at specific locations throughout the plants and utilize BioWin model for analysis
- Assess the feasibility of load shifting between Belmont and Southport plant
- Explore sludge fermentation options to cultivate VFA's

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QUESTIONS?

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