

From Waste to Worth: Phosphorus Recovery and Reuse

Yahara WINS Group Meeting
20 June 2023

Madison Metropolitan Sewerage District

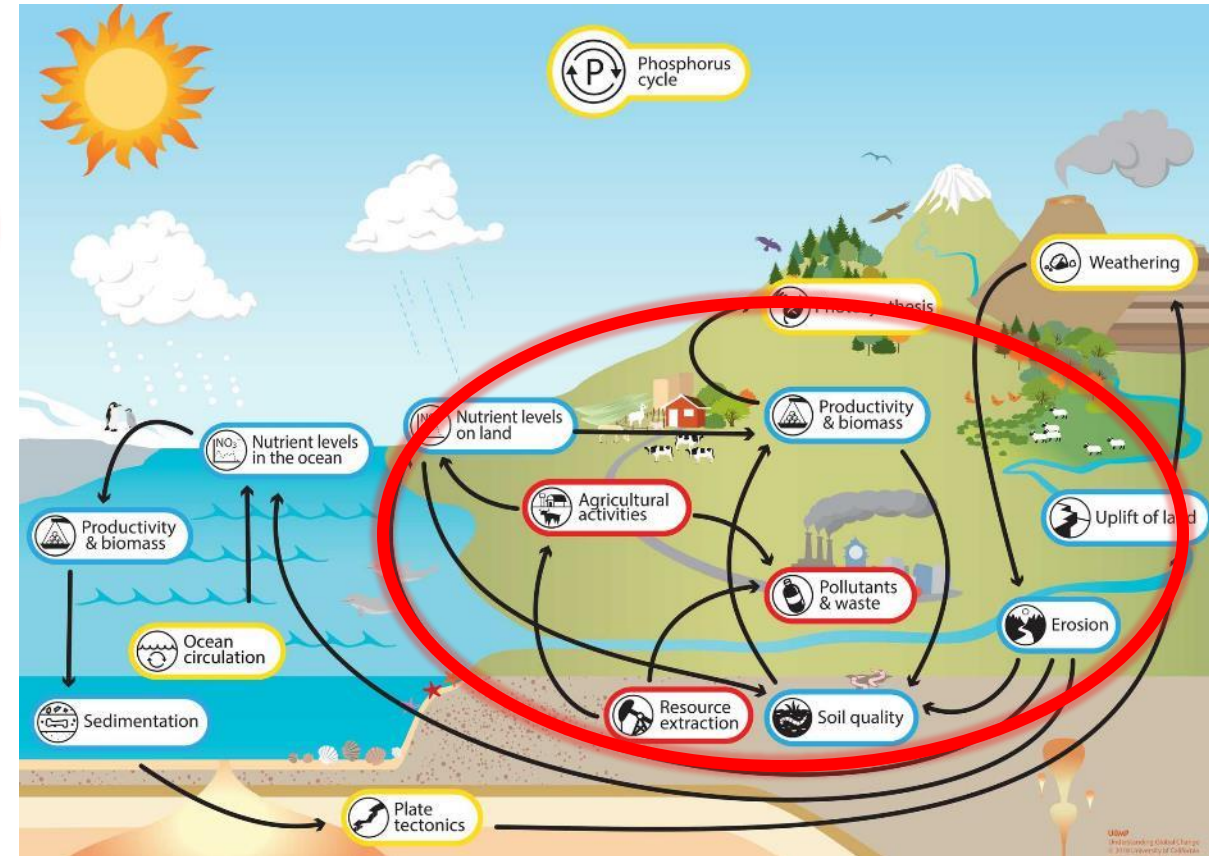
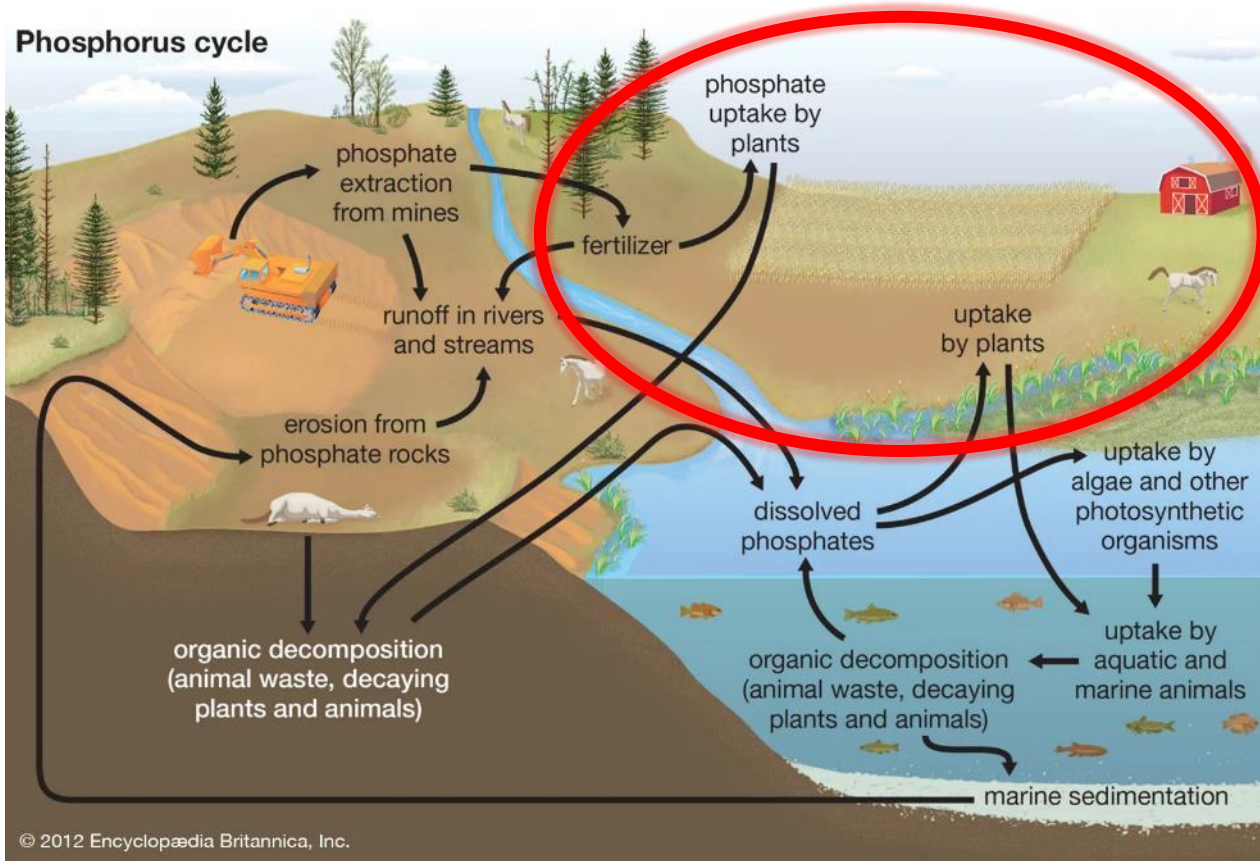




Agenda:

- P Cycle... and you
- Wastewater 101
- P Recovery
- Metrogro
- Questions

Phosphorus Cycle



Phosphorus Cycle, Wastewater... and You



Wastewater 101

- The District
- Collection
- Conveyance
- Treatment
- Recovery
- Reuse

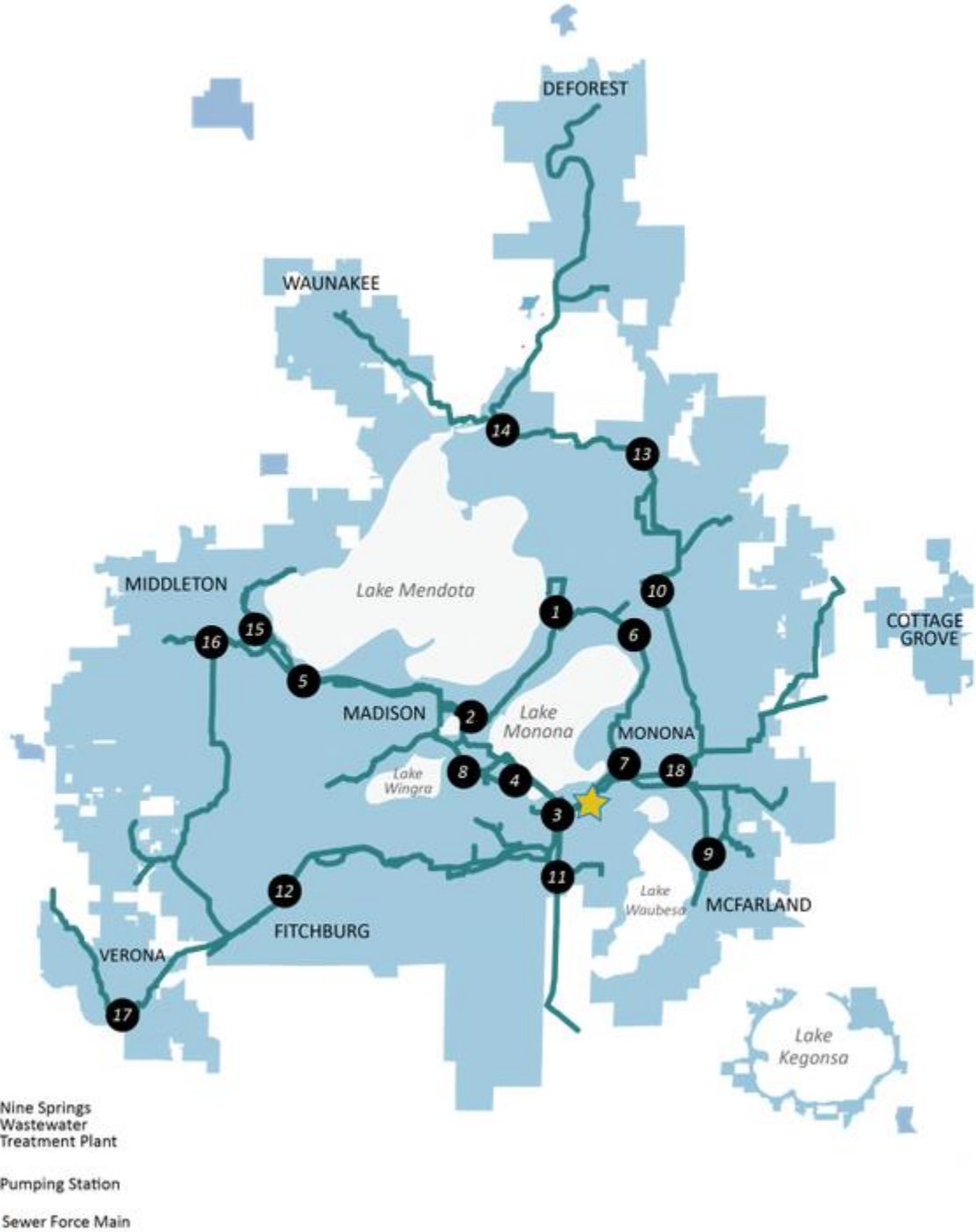


The District

Madison Metropolitan Sewerage District



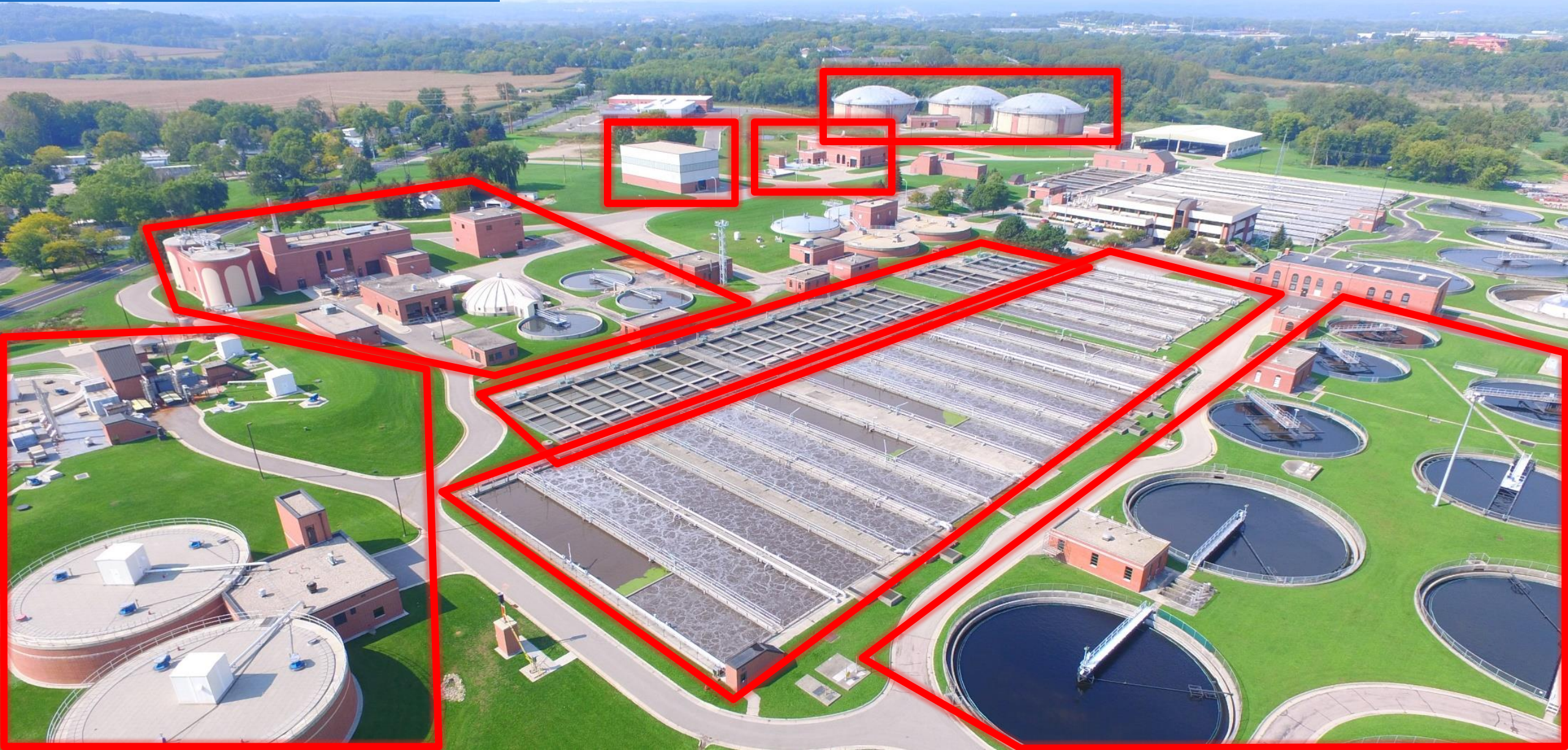
- 400,000 people served
- 145 miles of pipe
- 187 sq mile service area
- 18 regional pumping stations
- 36 million gallons per day
- 125 FT staff



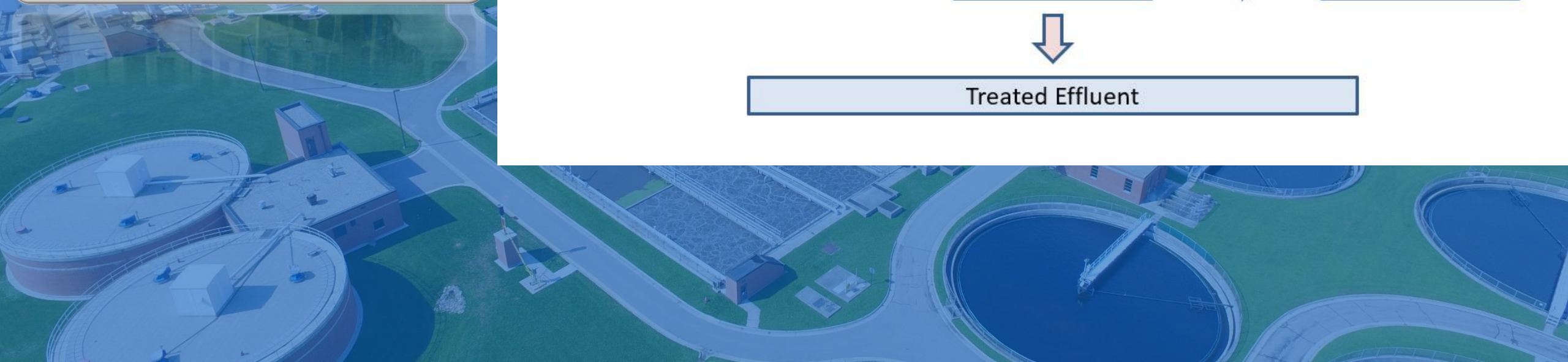
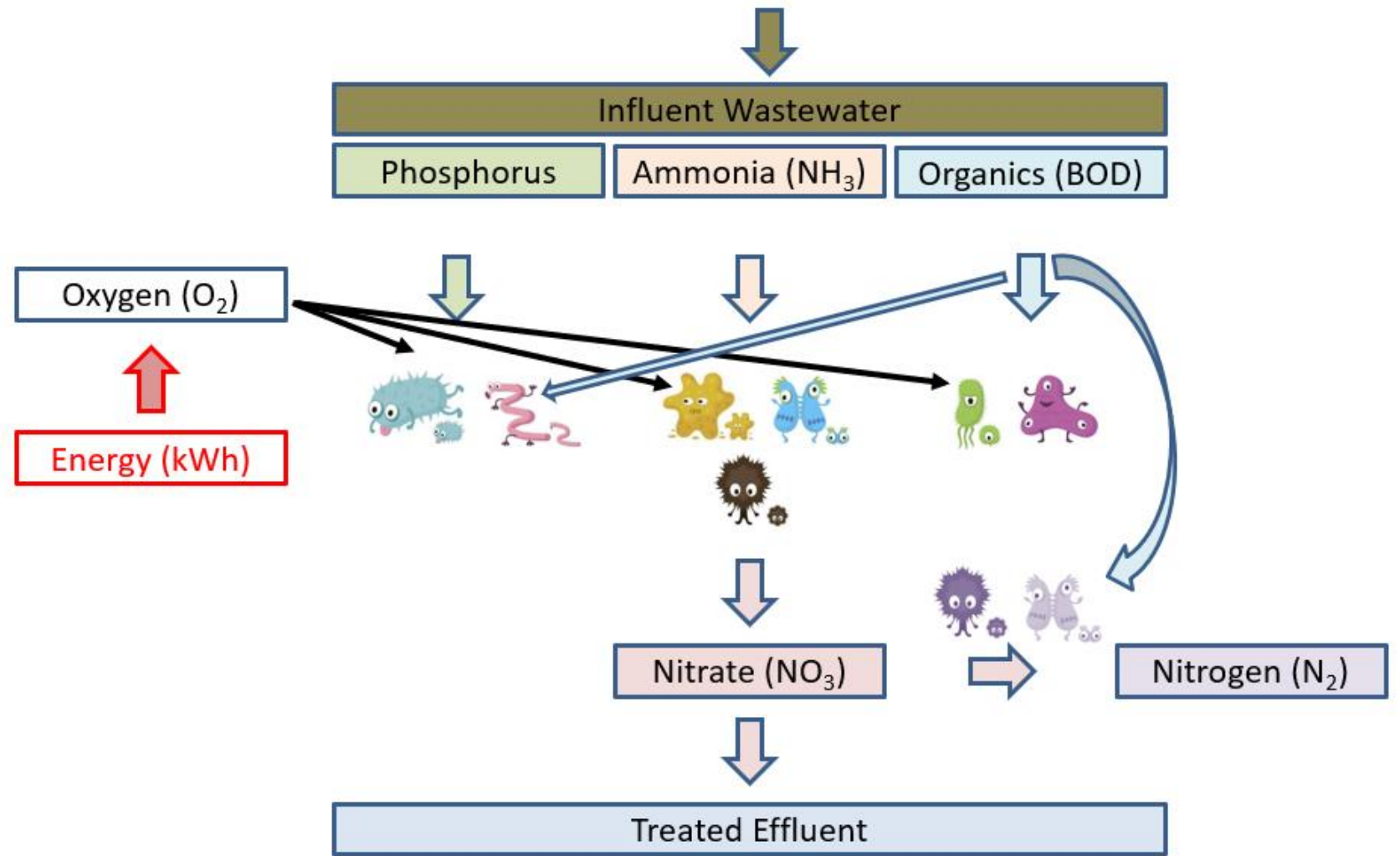
Madison Metropolitan Sewerage District

Collection & Conveyance

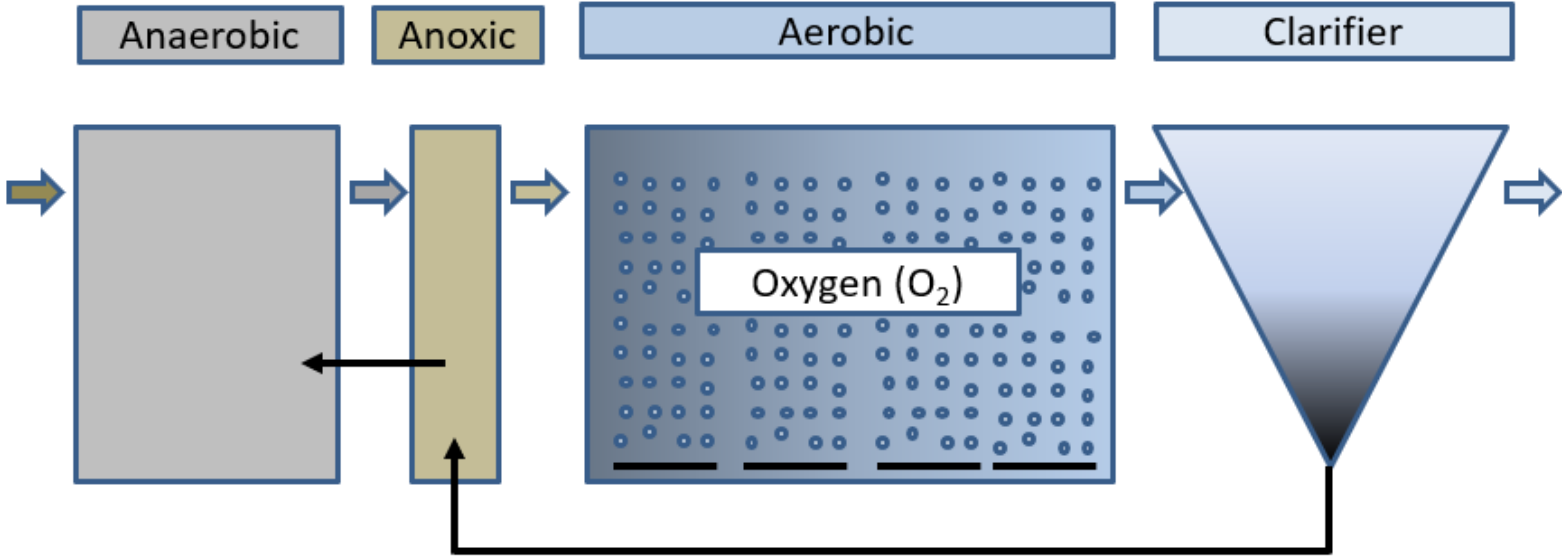
Treatment



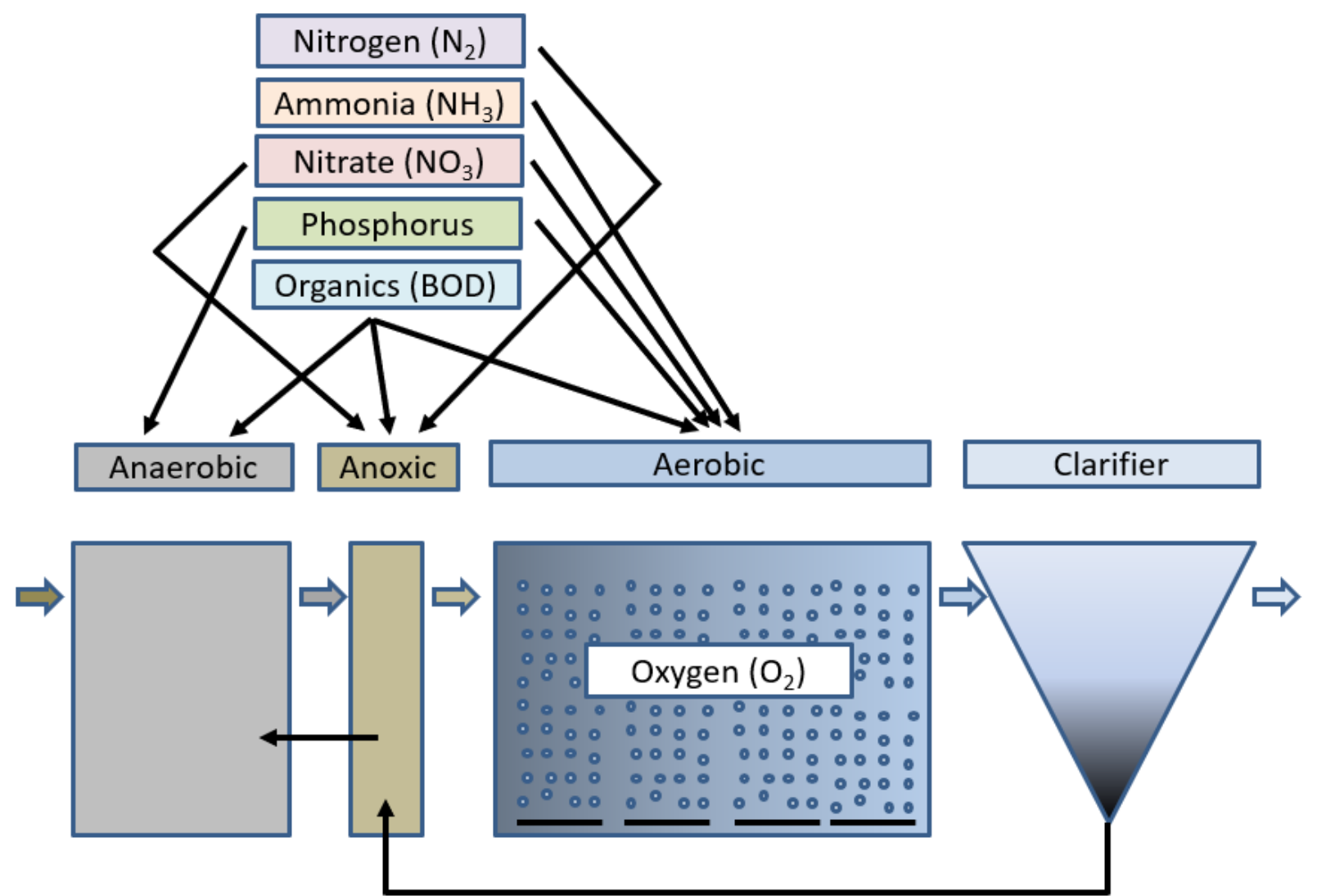
Treatment



Treatment



Treatment

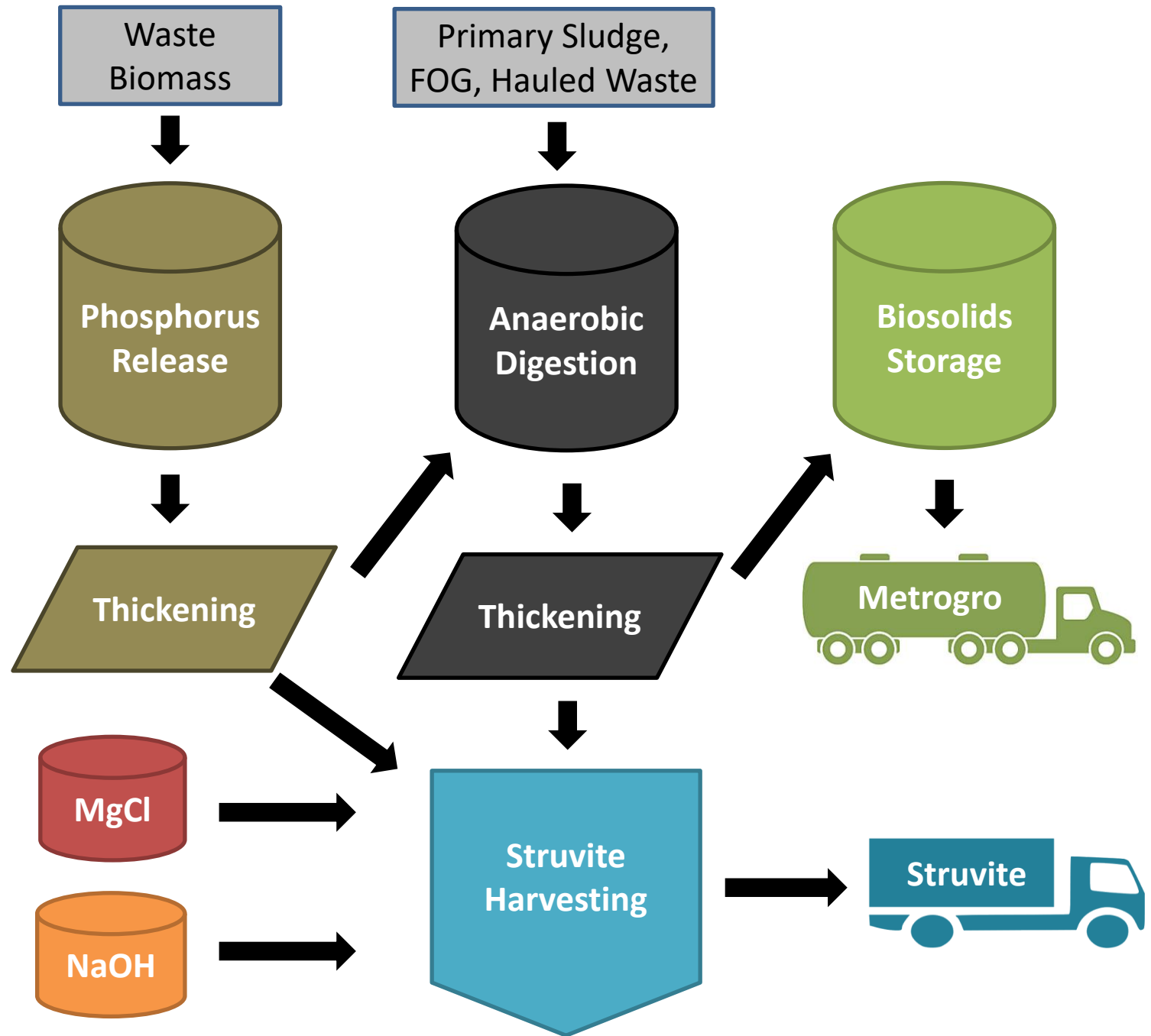




Review

- Multiple physical and biological steps involved
- No chemicals for liquids treatment
- Uses naturally occurring biology
- Phosphorus captured in biomass for beneficial reuse

Recovery & Reuse



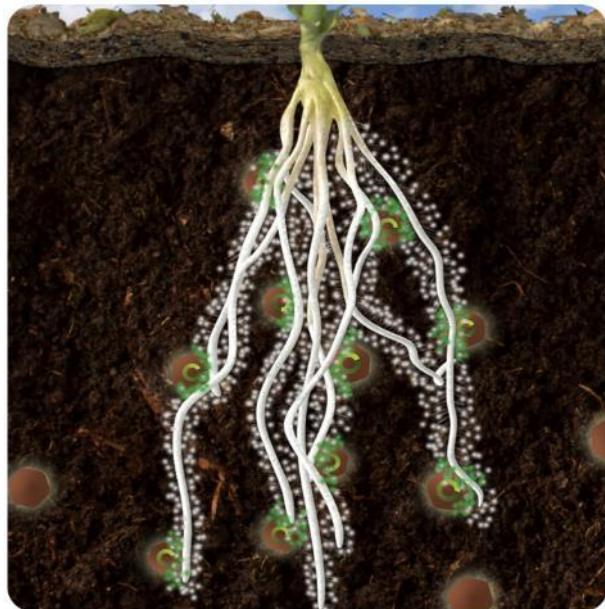
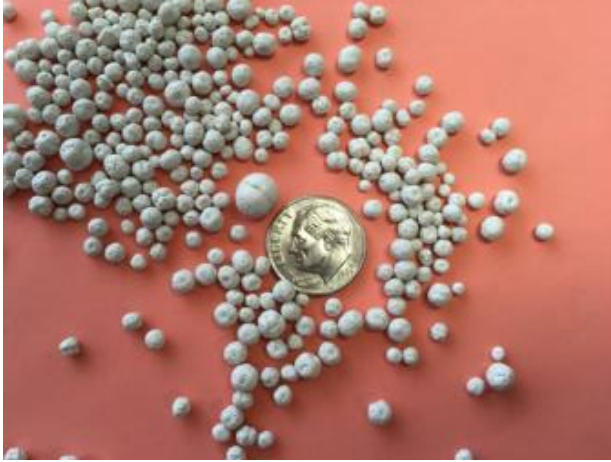
Struvite Challenges



MAGNESIUM AMMONIUM
PHOSPHATE HEXAHYDRATE



Struvite Recovery



Phosphate Leaching

Cumulative orthophosphate (ug)

2,250,000

1,500,000

750,000

0

0 10 20 30 40 50 60 70 80 90 100 110

Days after fertilization

MAP 100%

Blend
Crystal Green 66%
MAP 33%

Crystal Green 100%
Control

Variety: Bermuda Grass | Source: Elizabeth Guertal - Auburn University, AL, 2014-2015

Source: ostar.com

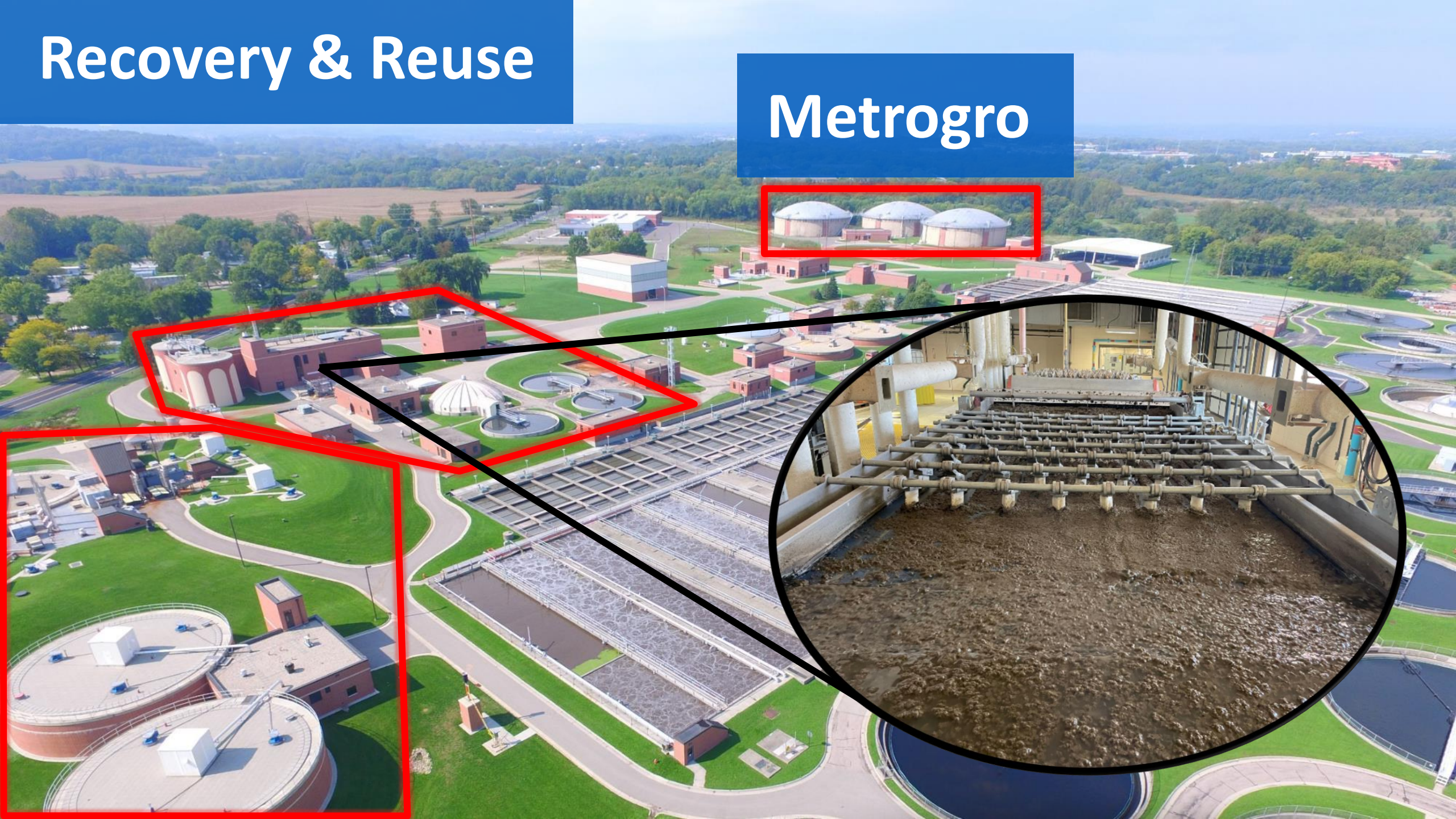


Summary

- Struvite is a phosphate mineral
- Produce about 600 tons/yr
- Able to export P out of watershed
- Struvite fertilizer has advantages over conventional fertilizers
- Struvite use has limited applications

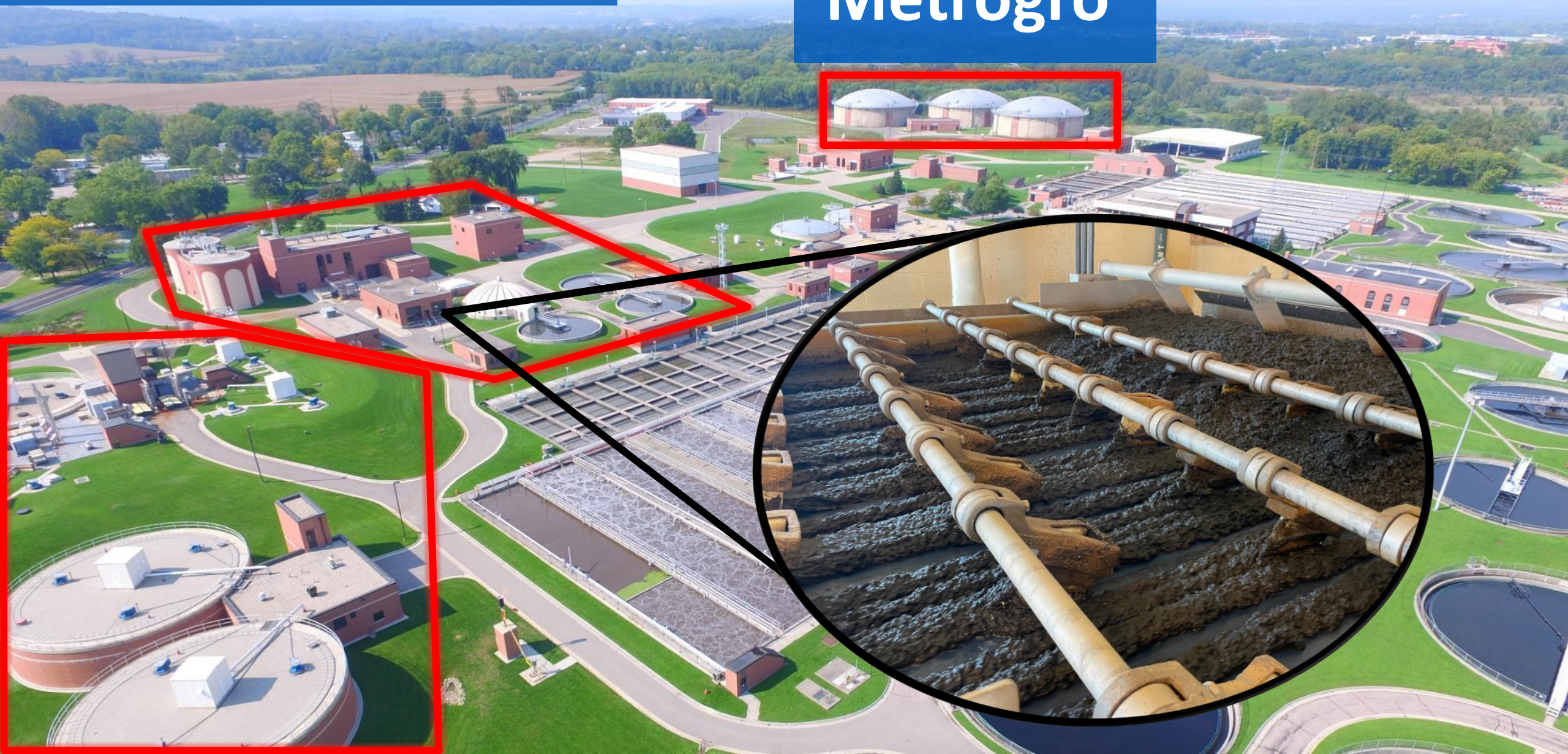
Recovery & Reuse

Metrogro



Recovery & Reuse

Metrogro



- Three – 6 million gallon storage tanks
- ~36 million gallons per year
- ~7,000 trips to fields per year
- At peak of season:
 - 17 trailers hauling at same time



Metrogro



- Fields located up to 35 miles from the treatment plant
- 4 applicators
- Hauling “seasons”
 - Spring = April/May
 - Fall = August - snowfall

Phosphorus Efforts

- Low disturbance injection
- 3 year application cycle
- Avoid fields that have high soil P content
- Nutrient availability study
- Alternative biosolids products



Summary

- Metrogro program returns P back into the food system
- Application managed to avoid runoff and prevent high soil P
- Application methods designed to minimize soil disturbance



In Conclusion

- Phosphorus is important
- Treatment and Recovery are complex operations
- Phosphorus is recovered so that it can be reused
- Reuse methods and products are designed to minimize negative impacts from using phosphorus



Thank you

Tungsten 74 W 183.84	Arsenic 33 As 74.92160	Tellurium 52 Te 127.60	Tungsten 74 W 183.84	Astatine 85 At [210]	Erbium 68 Er 167.259
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Iodine 53 I 126.904 47	Sulfur 16 S 32.065
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Fluorine 9 F 18.9984032	Uranium 92 U 238.02891	Nitrogen 7 N 14.0067
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