



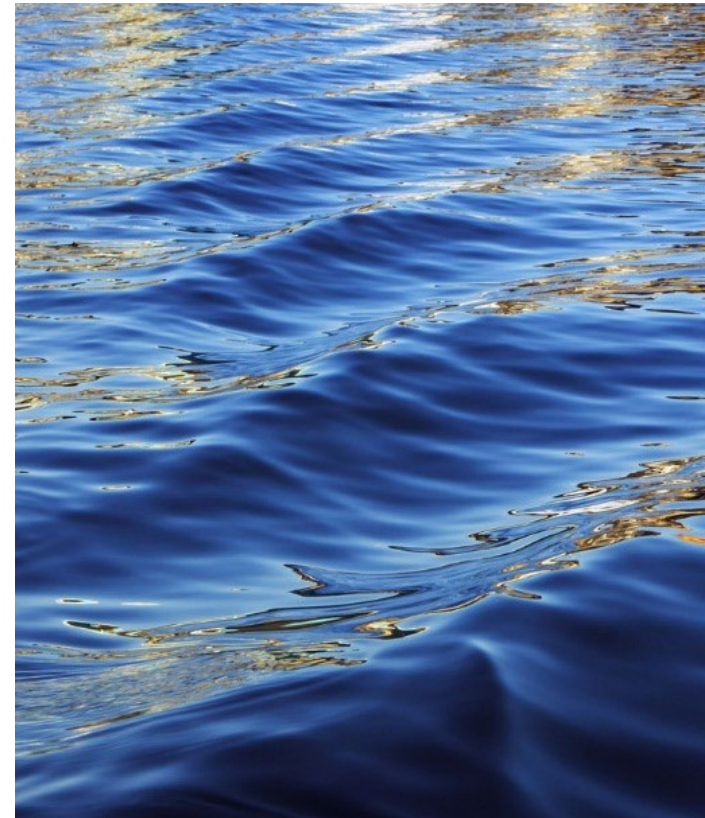
**Metropolitan Water
Reclamation District
of Greater Chicago**

Phosphorus in Industrial Wastewater

Probable sources and source controls

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Overview

- About phosphorus
- Phosphorus at MWRD water reclamation plants (WRPs)
- How to identify and control industrial phosphorus
- MWRD's next steps

What is Phosphorus?

- Naturally found in earth and rocks
- Essential to the formation of DNA and life on earth
- Supports growth in plants and animals
- Excess phosphorus that enters the environment from a wide range of human activities can over-stimulate algal growth





Too much of a good thing

- Excess phosphorus can overstimulate algal growth
- Algal growth can produce cytotoxins that can be harmful to humans and aquatic life
- Excess algae can use up available oxygen supply as it decomposes which can threaten survival of fish and other aquatic life

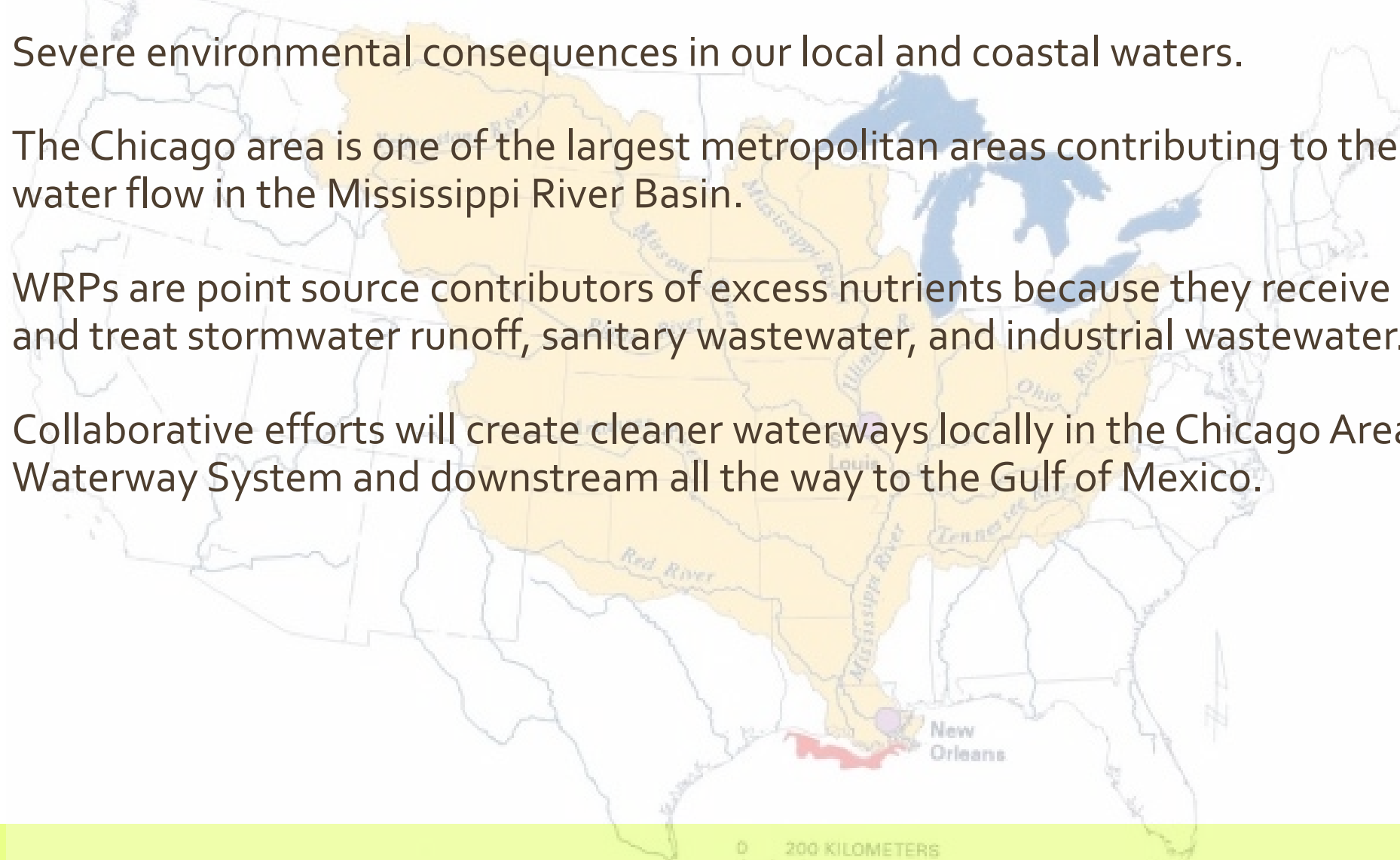


<https://www.epa.gov/nutrientpollution/issue>



Why do we need to remove phosphorus?

- Severe environmental consequences in our local and coastal waters.
- The Chicago area is one of the largest metropolitan areas contributing to the water flow in the Mississippi River Basin.
- WRPs are point source contributors of excess nutrients because they receive and treat stormwater runoff, sanitary wastewater, and industrial wastewater.
- Collaborative efforts will create cleaner waterways locally in the Chicago Area Waterway System and downstream all the way to the Gulf of Mexico.

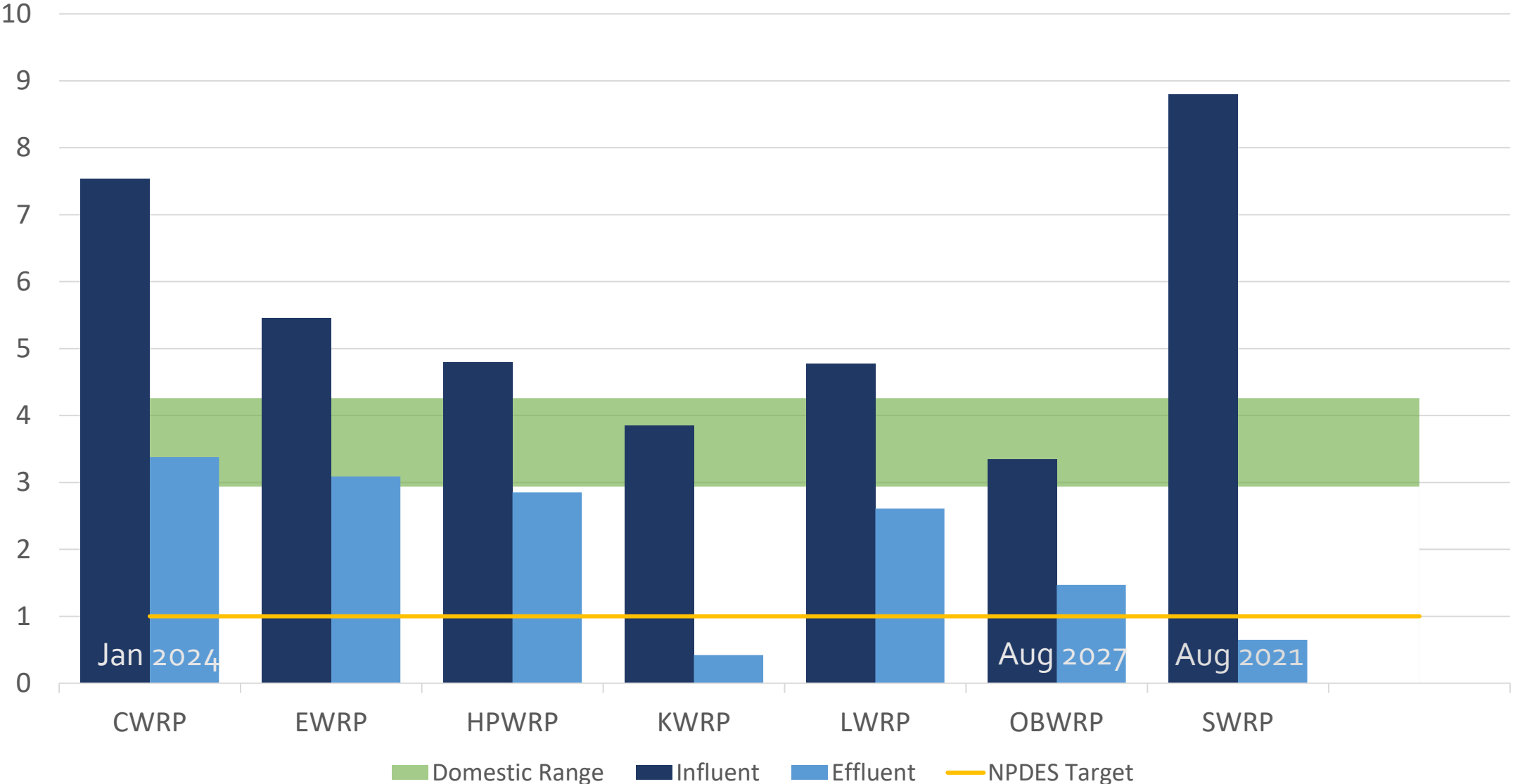




Phosphorus at MWRD's WRPs

- New limits rolling out for total phosphorus in our NPDES permit.
- Typical composition of untreated domestic wastewater TP (Metcalf & Eddy 5th edition): 3.7 mg/L low strength, 5.6 mg/L medium strength, 11.0 mg/L high strength.
- Each WRP has its own domestic sampling point.
- MWRD's domestic source for total phosphorus is 2.94 – 4.26 mg/L based on data collected in 2017, 2021, and 2022.
- End of Aug. 2023, dry weather avg of 5.3 mg/L at CWRP.

Average Total P in WRP Raw Influent and Final Effluent (mg/L)



Where does excess Phosphorus come from?



- Food processing
- Metal Finishing
- Industrial wastewater pretreatment
- Cleaning and Sanitation products





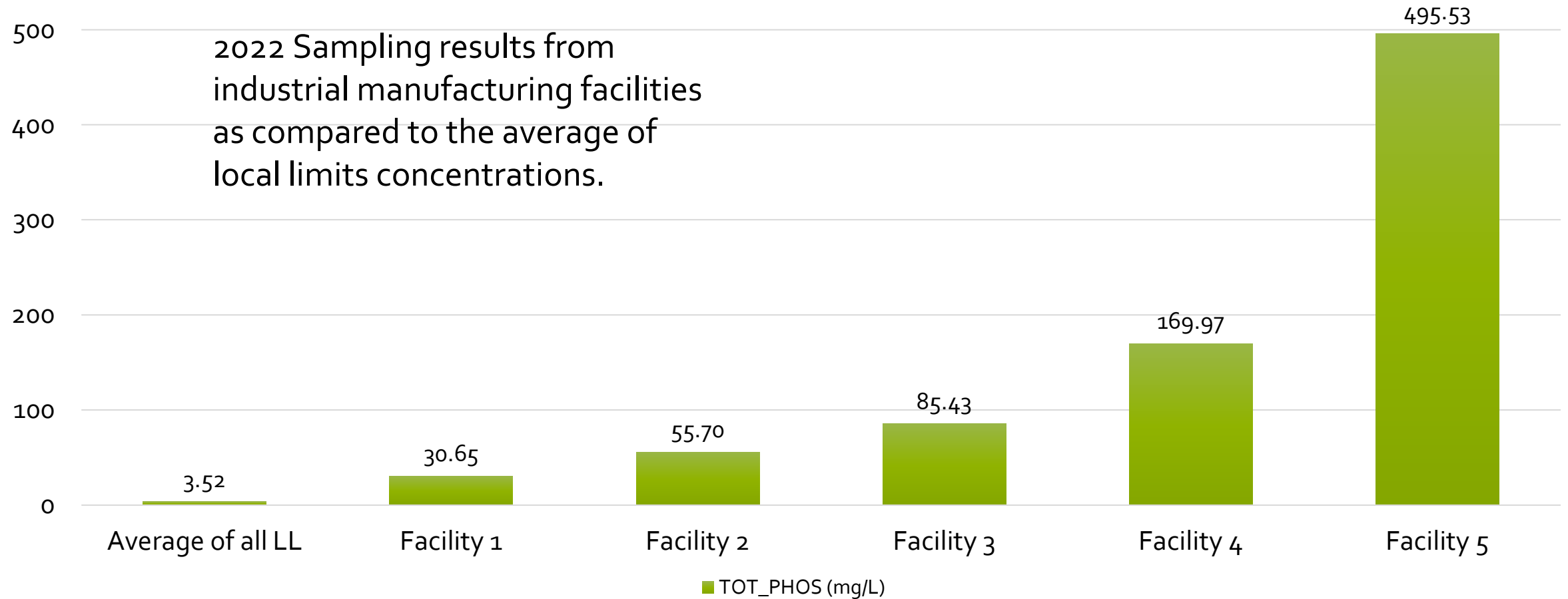
Industrial Phosphorus

Operations that typically generate high levels of phosphorus in wastewater

- Metal Finishing
 - Phosphating
 - Helps prevent corrosion
 - Prepares metal surface for improved paint adhesion (e.g. iron phosphate wash prior to powder coating)
 - Zirconium can be used as an alternative
 - Wastewater pretreatment processes
 - Phosphoric acid may be used to pH adjust caustic wastewater
 - Other acids can be used as a substitute
- Food Processing
 - Dairy processing
 - Meat packing/processing
 - Phosphorus is a component of cells of all living things
- Industrial Cleaning and Sanitizing Operations
 - Chemicals used to clean and sanitize industrial facilities can contain phosphoric acid



Industrial Phosphorus Concentrations





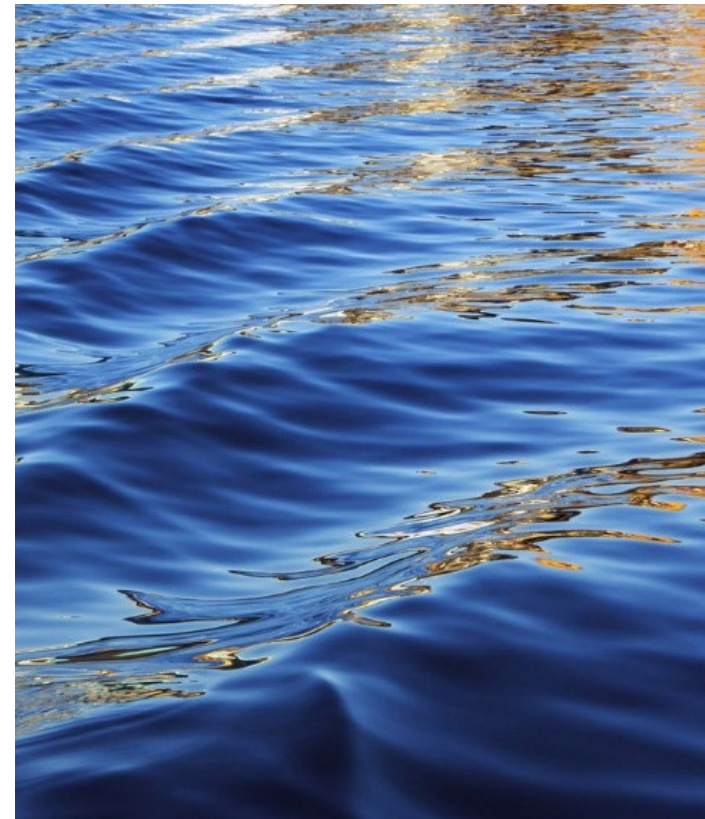
Cost of Phosphorus Removal at receiving plants

- In 2022, CWRP treated an average of 236 million gallons per day, with an average influent of 9.69 mg/L TP and 4.92 mg/L solP.
- About 50% of total phosphorus is removed during solids settling, not requiring chemical treatment.
- Estimated removal costs at CWRP to meet permit limits (O & M only) are just under \$7.50 per lb of P removed.
- Roughly 1,700 lbs/day of excess phosphorus is coming to CWRP from industrial users.
- **\$4.6 million dollars annually from industrial users at CWRP only.**
- SWRP is already using some chemical as backup to the biological P removal.



Source Control and BMPs

How to reduce phosphorus in industrial wastewater





Best Management Practices (BMPs)

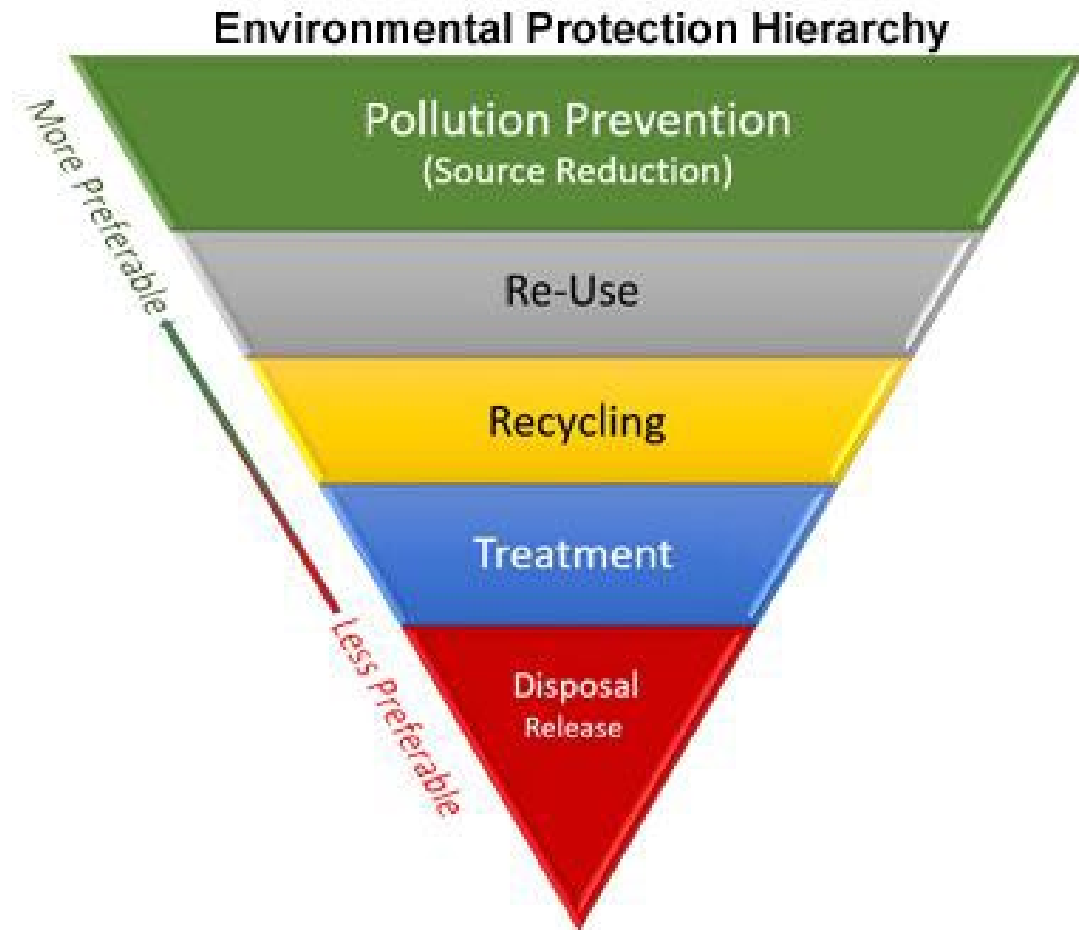
1. Understand water flow in your facility
 - a. What is your water used for? (i.e. bathrooms, cleaning, cooling, production)
 - b. Is water in equal to water out?
 - c. Identify each waste stream
 - d. Determine if and how each waste stream is pretreated prior to discharge
2. Identify and replace any cleaning or sanitizing products containing phosphoric acid
3. Dry clean, wipe down, sweep, vacuum as much as possible prior to wet cleaning





Why is phosphorus reduction beneficial?

1. Cost savings
 - a. Practices used to reduce phosphorus can also reduce overall User Charge
2. Point source phosphorus reduction
 - a. Reduces raw materials and/or resources used
 - b. Reduced costs to remove phosphorus from smaller volumes of wastewater
3. Phosphorus is an essential and finite resource



Free Help!

Contact The Illinois Sustainable Technology Center's Technical Assistance Program (TAP) or The Cook County Department of Environment and Sustainability's (DES) free Businesses Reducing Impact on the Environment (BRITE) program for a comprehensive assessment and/or free site visit:

<https://tap.istc.illinois.edu/services/>

[Illinois TAP: Free Site Visits](#)

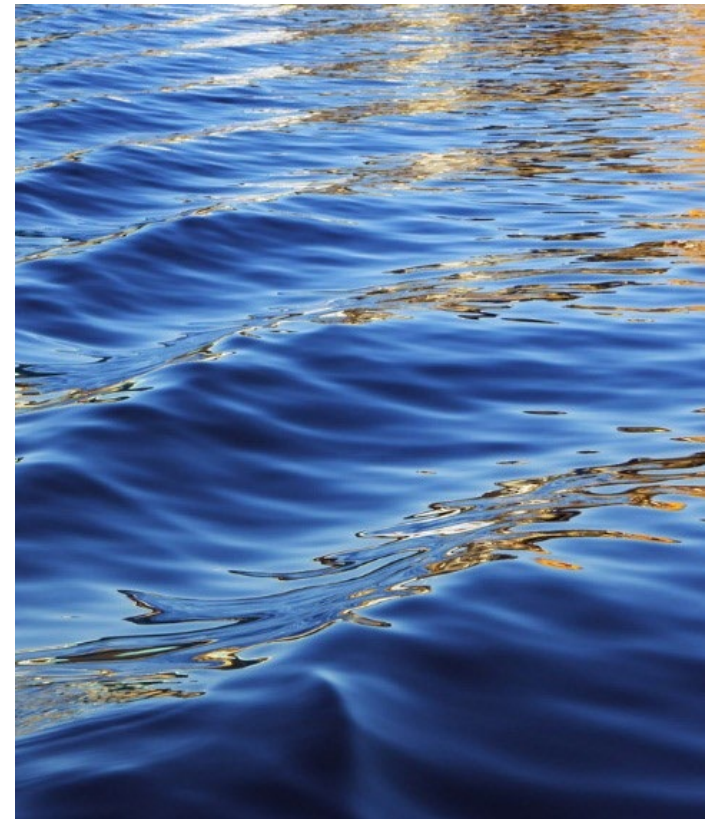
[Businesses Reducing Impact on the Environment \(BRITE\) Program](#)
[\(cookcountyil.gov\)](#)





MWRD Next Steps

What to expect from us moving forward





MWRD's Next Steps

- Modify current wastewater treatment processes to remove excess phosphorus to meet the new NPDES phosphorus limit of 1.0 mg/L





MWRD's Next Steps

- Determine overall costs to remove phosphorus and meet NPDES permit limits
- Sample for phosphorus at IUs
- Modify our cost recovery program or create phosphorus surcharge
- Recover costs for excess phosphorus removal at our WRPs





Additional Resources

- Illinois Nutrient Loss Reduction Strategy
 - <https://agr.illinois.gov/resources/nutrientloss.html>
- Illinois Sustainable Technology Center's Technical Assistance Program (TAP)
 - <https://uofi.app.box.com/s/6rzfmtrern3swl7cibov1gqjtsci9mjk>
- University of Minnesota's Technical Assistance Program
 - Sister program with University of Illinois
 - [Documents and information about reducing phosphorus](#)
- USEPA Resources
 - [Hypoxia 101](#)
 - [Pollution Prevention Resources](#)
 - [Cost Data Associated with the Impacts and Control of Nutrient Pollution](#)

Thank You

**Questions? Contact MWRD's
Industrial Waste Division**

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