



# WRF Pilot Recovered the Highest Rate of Total P

## Water Research Foundation (WRF) Pilot

The CalPrex™ pilot ran as a 10 gallon per minute system in the fall of 2018 at Nine Springs Treatment Plant, a 42 MGD facility in Madison, Wisconsin. The pilot was situated between the acidogenic and methanogenic digesters. CalPrex was fed with acid digest. [1] A Centrisys CS10-4 decanter centrifuge dewatered the feed to 20% solids, which were conveyed to a [2] recombination tank. Centrate was dosed with [3] calcium hydroxide, causing the precipitation brushite, a form of phosphorus. The brushite settled in a lamella clarifier. Clarifier overflow was recombined with the [2] acid digest cake and discharged to the methanogenic digester. The settled brushite was dewatered and cake was dried as a high-quality fertilizer for a USDA-funded fertilizer study.

## Pilot Results

CalPrex demonstrated its ability to recover high rates of total and soluble phosphorus before the digesters. Preliminary pilot performance analysis indicates a 66% solubilization rate in the fermented sludge after the phosphorus release that went to the Ostara process in Madison. There was a 44% of the total phosphorus captured with a 89% soluble phosphorus reduction in the CalPrex reactor. The pilot system's clarifier effluent averaged 44 mg/L soluble phosphorus.

## How CalPrex Works

CalPrex incorporates thickened sludge from a fermentation tank or acid digester to increase the amount of soluble phosphorus which increases the phosphorus recovery potential. CalPrex is uniquely suited for recovering a high rate of soluble phosphorus by adding calcium hydroxide without the need of ammonium. This high-value solution is for facilities needing phosphorus removal and recovery:

- Prior to thermal hydrolysis
- From waste activated sludge and/or primary sludge prior to anaerobic digestion
- From aerobic and post-aerobic digestion (PAD)

CalPrex is a viable solution for utilities seeking to mitigate operations and maintenance issues related to struvite scaling and poor sludge dewaterability.

## PILOT RESULTS

### Nine Springs Treatment Plant



Solubilized **66%** of the Feed Phosphorus



Mineralized **89%** of the Feed Phosphorus



Recovered **66%** of the Soluble Phosphorus as Brushite



Recovered **44%** Total Phosphorus



Reduced Struvite Precipitation Potential in the Digesters



**No** Ammonium Required



## 11 Organizations

### Involved in WRF Pilot

- Water Research Foundation (WRF)
- Nine Springs Treatment Plant (Madison, WI)
- Milwaukee Metropolitan Sewerage District (Milwaukee, WI)
- Metro Wastewater Reclamation District (Denver, CO)
- Massachusetts Water Resources Authority (Boston, MA)
- Colorado School of Mines (Golden, CO)
- University of Wisconsin-Madison (Madison, WI)
- Black and Veatch (Madison, WI)
- Hazen and Sawyer (Virginia Beach, VA)
- Centrisys/CNP (Kenosha, WI)
- Nutrient Recovery and Upcycling (Madison, WI)

A peer-reviewed study will be published by WRF to elaborate on the CalPrex process performance, benefits, costs and larger scale impact.

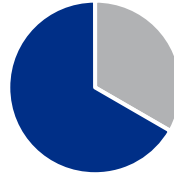


Steady State™ is a sustainable fertilizer brand by Nutrient Recovery and Upcycling (NRU). NRU is the distribution channel for the recovered nutrients from AirPrex and CalPrex. To learn more, visit [www.newsteadystate.com](http://www.newsteadystate.com) or [www.nrutech.com](http://www.nrutech.com).

## CalPrex Pilot Phosphorus Recovery

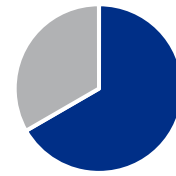
Madison Metropolitan Sewerage District's Nine Springs Treatment Plant  
Pilot Test Fall 2018

CalPrex Influent: Total Phosphorus



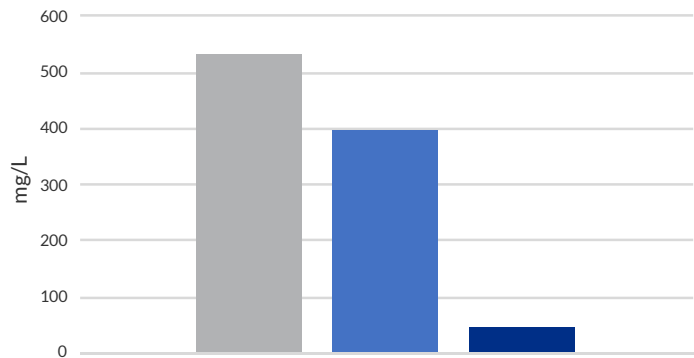
■ Particulate Phosphorus  
■ Soluble Phosphorus

Soluble Phosphorus Recovery by CalPrex



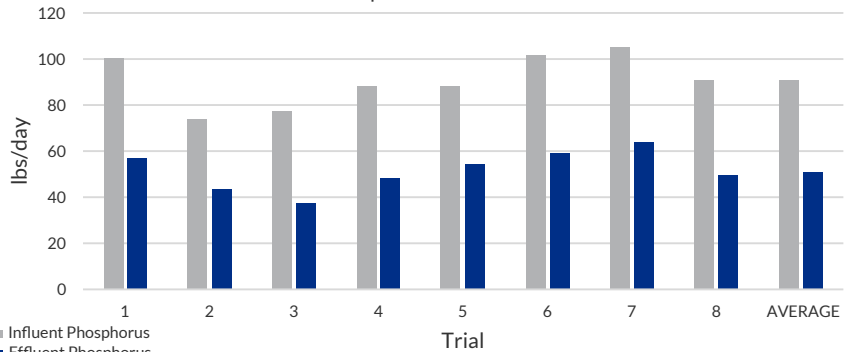
■ Captured by CalPrex  
■ Returned to the Nine Springs System Flow

Soluble Phosphorus Concentrations



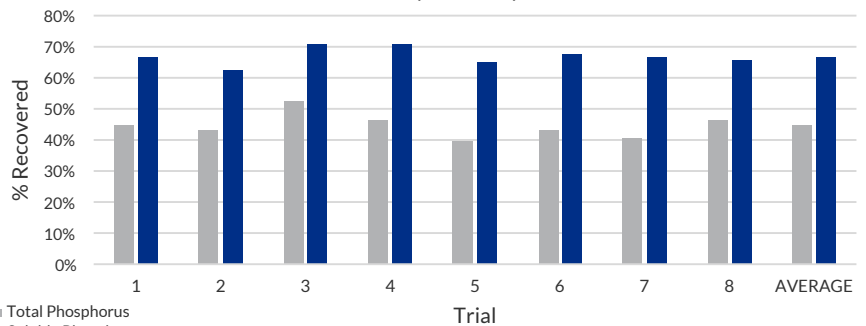
■ Fermented Sludge (Acid Digest) Influent  
■ Centrate (Diluted by Polymer)  
■ CalPrex Clarifier Effluent

Phosphorus Reduction



■ Influent Phosphorus  
■ Effluent Phosphorus

Recovery Efficiency



■ Total Phosphorus  
■ Soluble Phosphorus

The CalPrex™ Technology is licensed from Nutrient Recovery and Upcycling LLC.