# Lake Thunderbird Water Reuse
# Field Research Project for Inland Indirect Potable Reuse

*Bureau of Reclamation*
Water Reclamation and Reuse Research under the Title XVI Program for
Fiscal Year 2019, Funding Opportunity Announcement No. BOR-DO-19-F009

## *Brief Overview*

In 2012, the Oklahoma legislature passed the Water for 2060 Act, with a statewide goal of consuming no more fresh water in 2060 than was consumed in 2010. In response, the Oklahoma Department of Environmental Quality (ODEQ) began an aggressive campaign to promulgate both non-potable and potable water reuse regulations.

By expanding its existing water reclamation and reuse with an indirect potable reuse (IPR) project through Lake Thunderbird, the City of Norman plans to trim the demand placed on its groundwater supply and potentially eliminate a need to purchase finished water. The results from this study could impact future potable reuse projects across the country by validating a treatment strategy that does not generate a high-concentrate waste stream (brine) and the challenges associated with its disposal for inland states.

The project will determine if IPR for Lake Thunderbird is cost-effective. IPR would take highly treated water from the Water Reclamation Facility and return it to Lake Thunderbird, providing a drought-proof reservoir.

The IPR Pilot Project will test different technologies and strategies to optimize treatment. The study will take about two years to complete, and is planned to start in early 2020. This will allow time for different technologies to be tested and operations optimized under varying seasonal conditions.

This project will be the first of its kind in the Oklahoma region. The project provides valuable information, resources, and proven technologies for additional IPR projects for other middle America states that are not near an ocean.

Citizen Advisory Committee members from Midwest City, Del City, and Norman will meet regularly to oversee the pilot project and communicate with respective communities.

A drought-proof municipal water supply for the cities of Midwest City, Del City and Norman.

The water quality targets from this project are set to meet the Safe Drinking Water Act requirements.

Lake Thunderbird is an "impaired water body" listed on the 303(d) list for Dissolved Oxygen, Turbidity, and Chlorophyll-a. The quality of water produced by the IPR project would be so high, it is anticipated to improve the overall water quality of the lake.

This project will also benefit wildlife, boaters, recreation, and tourism in the area by helping to maintain lake levels.

The IPR Pilot Project has received a WaterSMART grant from the Bureau of Reclamation Department of the Interior for $700,000 — *the only Title XVI research grant NOT awarded to California!* The Pilot Project kicks off in early 2020 and will take about two years to complete.

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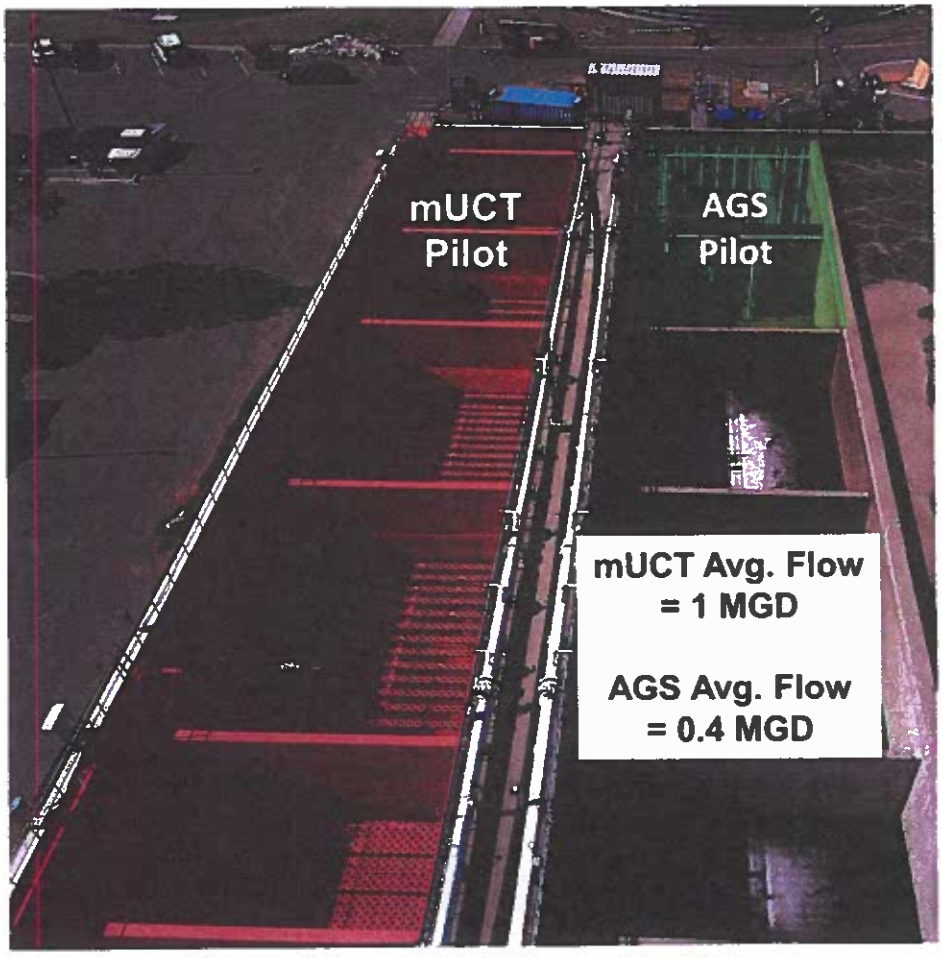
## *Key Objectives:*

- Demonstrate operating conditions needed to meet IPR effluent targets
- Determine whether a plant-wide conversion to biological nutrient removal (BNR) is necessary, or if a dedicated, reduced-footprint BNR system can be used for reuse flow




### *mUCT Pilot*

- Modified University of Capetown (mUCT) Process
- Flow-through reactor with recycle streams
- Recycle stream locations and flowrates can be optimized for various loadings and target effluent

### *AGS Process*

- Aerobic Granular Sludge (AGS) Process
- Batch reactor – similar to a Sequencing Batch Reactor (SBR)
- Loading, settling, and decanting all designed to produce "Granular" sludge
- Granules allow for multiple removal pathways in the same reactor

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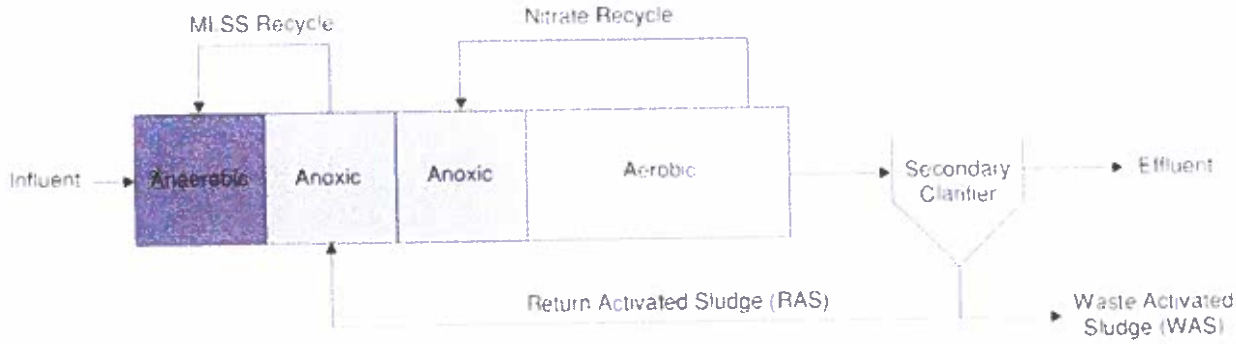
***This fact sheet is intended to serve as a cursory overview of the two Biological Nutrient Removal (BNR) basins in operation as part of the Lake Thunderbird IPR Research Project.***

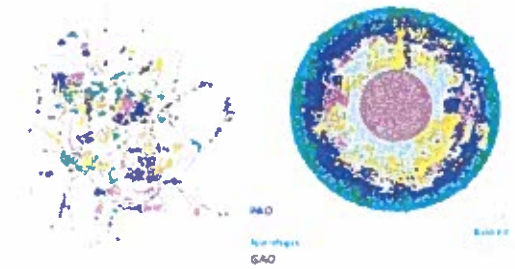
## *Modified University of Capetown (mUCT) Process*

1. The mUCT process includes alternating environments to promote different "types" of microorganisms
2. Nitrogen removal - in the aerobic zone, we nitrify/oxidize ammonia to nitrate, and then in the anoxic zone, facultative organisms reduce the nitrate to elemental nitrogen (N2) gas that is off-gassed harmlessly to the atmosphere
3. Phosphorus removal - we again use alternating aerobic-anaerobic zones to promote the growth of Phosphorus Accumulating Organisms (PAOs) - in the anaerobic zone, PAOs are able to outcompete normal heterotrophic bacteria due to the anaerobic conditions, and in the aerobic zone, PAOs oxidize/uptake phosphorus and allow for phosphorus to be removed through sludge settling/wasting




## *Aerobic Granular Sludge (AGS) Process*

1. The AGS process utilizes a Sequencing Batch Reactor (SBR) configuration to produce AGS as opposed to flocculant sludge that is found in plug flow reactors.
2. AGS granules contain agglomerated, biofilm-forming bacteria and are not supported by an engineered media. Because the granules are relatively large and dense, the granules tend to maintain aerobic conditions on the exterior of the granule and anoxic/anaerobic conditions within the interior of the granule.
3. These varying zones within the granule provide the anoxic/anaerobic environments necessary for nitrogen and phosphorus removal. Therefore, it is not necessary to provide aerated/anaerobic zones within the reactor, as the entire reactor can be aerated and the granules provide low-DO conditions within the granule.

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