

## AZ Water Student Design Competition 2020

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### Project

Kyrene Water Reclamation Facility: Rehabilitation and Startup

### Project Components

- Determine Design Flow and Loading Rates
- Treatment Process Decision Matrices
- Plant and Process Optimization
- Preliminary Design and Hydraulic Profile
- Preliminary evaluation for capital and operational costs

### Background

The Kyrene Water Reclamation Facility (KWRF), is located on Guadalupe Road and is owned by the City of Tempe. The Facility was constructed in 1991 and expanded in 2006 to a maximum month flow of 9 MGD. Major processes at the Facility consists of coarse and fine screening, grit removal, aeration (BNR), membrane filtration, and UV disinfection. The Facility was designed to be a scalping plant where it pulls a portion of the wastewater from the Guadalupe Road Sewer line.

In 2010, the City made the decision to take the KWRF offline. The Facility has been unstaffed, and the City sends all of the wastewater generated within City boundary to the 91<sup>st</sup> Avenue Wastewater Treatment Plant. Approximately 70% of the flow delivered by Tempe on an annual basis, 90% in summer, is committed for use at the Palo Verde Nuclear Generating Station, the Buckeye Water Conservation & Drainage District, and Tres Rios Constructed Wetlands. Reactivation of the KWRF will enable the city to capture, treat and utilize the balance of its reclaimed water potential to augment the City's long-term assured water supply.

The City has conducted planning studies and anticipate construction completion and start-up of the KWRF in 2025. The City projects 3.0 MGD average daily flow of Class A+ effluent will be generated at the KWRF when it is reactivated, out of the approximately 4.0 MGD current flow in the wastewater collection system upstream of the facility. Half of the effluent generated may be used for irrigation at the Ken McDonald Golf Course and for cooling water at Salt River Project's Kyrene Generating Station. The remaining half of the total effluent generated at the Facility will be available for groundwater recharge. The City is also open to developing other direct uses of reclaimed water from the facility in the future.

### Problem Statement

The project team shall evaluate and summarize historic wastewater flow rates and loadings characteristic data. The team shall research and evaluate existing and emerging treatment process technologies to be retrofitted within the available footprint that meet the water quality parameters of Class A+ effluent and regulations required for potential reuse applications. As part of the evaluation, the project team shall also consider and make recommendations regarding solids handling and disposal. The

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design criteria for the project will be a combination of the City's desired treatment capacity and the team's analysis of historical wastewater data and the recommended use of the effluent water. The team shall determine what improvements can be made to meet the City's desired future treatment capacity and required effluent water quality parameters. Emphasis shall be placed on optimizing the process for overall treatment efficiency including chemical and energy use. In addition, the project teams might identify opportunities for the Facility to be used for academic and research activities in partnership with the State University System.

The project shall include the following components:

1. Analysis of historic flow and wastewater characteristic data to develop design criteria (flow, peaking factors, concentrations, design life, etc.).
2. Analysis and Summary of existing treatment process.
3. Research and recommend existing or emerging treatment process technologies using a Decision Matrix which evaluates, at a minimum: social and environmental factors as well as the lifecycle cost of the potential use.
4. Selection of desired treatment process/technology using a Decision Matrix which includes, at a minimum: feasibility/constructability, lifecycle costs, maintenance and operation requirements, staffing levels, process efficiency improvements, etc.
5. Final report that presents and discusses the following:
  - a. Summary of historical operating data, and determination of design criteria.
  - b. Analysis of existing treatment process.
  - c. Evaluation of existing and emerging process technologies.
  - d. Selections for process improvements, retrofits, and energy optimization.
  - e. Provide Cost Estimate and Lifecycle Cost Estimate.
  - f. How the proposed improvements will be implemented or constructed (phasing) as well as proposed staffing levels required.

### Additional Information to be Provided

1. Flow and Wastewater Quality Data
2. *Basis of Design Report*
3. Selected As-Built Drawings