

NOTICE OF INTENT TO AWARD

This notice is not a request for applications. This provides public notice of the Bureau of Reclamation's intention to fund the following project activities without full and open competition.

ABSTRACT	
Opportunity Number	BOR-DO-18-N016
Project Title	Scaling-resistant RO/NF membrane for concentrate minimization
Recipient	University of Colorado, Boulder
Anticipated Total Project Costs	\$206,334.00
Anticipated Federal Amount	\$206,334.00 (over 3 years)
Anticipated Completion Date	September 30, 2021
Statutory Authority	Public Law 111-11, Section 9504(b) Research Agreement Authority
CFDA Number	15.560 Secure Water Act Research Agreements
Reclamation Point of Contact	Janeen Koza 303-445-3446 jkoza@usbr.gov

SUMMARY OF PROJECT ACTIVITIES

Under this Agreement, chlorine-resistant membrane chemistry developed by Reclamation will be evaluated against chlorine-resistant membrane chemistry with or without nanoscale surface patterns. The Reclamation proprietary chemistry appears to provide inherent scaling resistance and work by others indicate that nanoimprinted membranes also provide scaling resistance. The intent of the proposed project is to incorporate one or both of these technologies into new commercially viable membranes that will increase the available water recovery from impaired sources. The federal funds will support personnel, and travel needed to accomplish the development objectives over a 3-year time frame.

Researchers at the University of Colorado – Boulder will focus on the following tasks:

- create and benchmark TFC RO/NF membrane samples without patterned surfaces
- create TFC/RO and benchmark membrane samples with patterned surfaces
- evaluate scaling resistance for all TFC/RO membrane samples and identify (and fabricate greater amounts of) the optimum membranes

- perform extended filtration of supersaturated scaling solution(s) with the two most-, and one least-effective, scaling-resistant, factor-level TFC RO/NF membrane combinations including quantitative measurements of the crystallization material balances
- develop techno-economic model of the value of degrees of scaling-resistant membrane figures-of-merit within current and envisioned concentrate minimization process designs
- deliver a final report of the findings along with journal publications to transfer the knowledge gained and share with the public

SELECTION JUSTIFICATION

Reclamation did not solicit full and open competition for this award based on the following the unique qualifications of the principal investigator, the proximity of the investigator to Reclamation researchers located in Denver, Colorado, the ability to leverage the results of previous research performed collaboratively with the principal investigator, the proximity of the investigator to Reclamation researchers located in Denver, Colorado, and the ability to reduce the overall cost of the project by performing the work under the Rocky Mountains Cooperative Ecosystem Studies Unit Joint Venture Agreement.

John Pellegrino, a Research Professor at the University of Colorado Boulder is one of the first inventors of the nanoimprinting of membranes and his expertise will be fundamental to this project. Professor Pellegrino has extensive experience and knowledge relating to mass transfer and chemical engineering principals and chlorine-resistant membrane chemistry. Dr. Pellegrino's unique expertise in membranes and the resulting concentrate areas is vital to the success of this fundamental research project.

Reclamation staff have worked with Dr. Pellegrino in the past on various activities and results from those projects will be leveraged in this research. Recently, Dr. Pellegrino submitted the findings on a joint Reclamation and CU Boulder project to the Journal of Separation and Purification and this publication will be available to the public upon its acceptance by the journal. The joint study's focus was on gaining a fundamental understanding of crystallization kinetics in order to make crystallization and precipitation of sparingly soluble salts more predictable and find strategies to mitigate and/or enhance crystallization/precipitation. This previous work is very complimentary to the upcoming effort in developing more scaling resistant membranes. By being able to have a more robust membrane and being able to predict crystallization/precipitation, the performance of membrane-based processes can be increased significantly which will lower the cost of membrane water treatment.

Reclamation staff will need to work collaboratively alongside the researchers in order to accomplish the project goals. To establish this type of work environment, it is necessary for the researchers to be located near Reclamation's researchers stationed in Denver, Colorado. The University of Colorado is the only university within 30 miles of the Denver Federal Center that has the access to the equipment and instrumentation required to complete this project, and access to the resources and expertise necessary for the successful completion of this project.

Further, the University of Colorado, Boulder, is a partner of the Rocky Mountains Cooperative Ecosystem Studies Unit (CESU). As a partner, the University is required to reduce its facilities and administrative rate to 17.5% which significantly reduces the project cost to the Government.