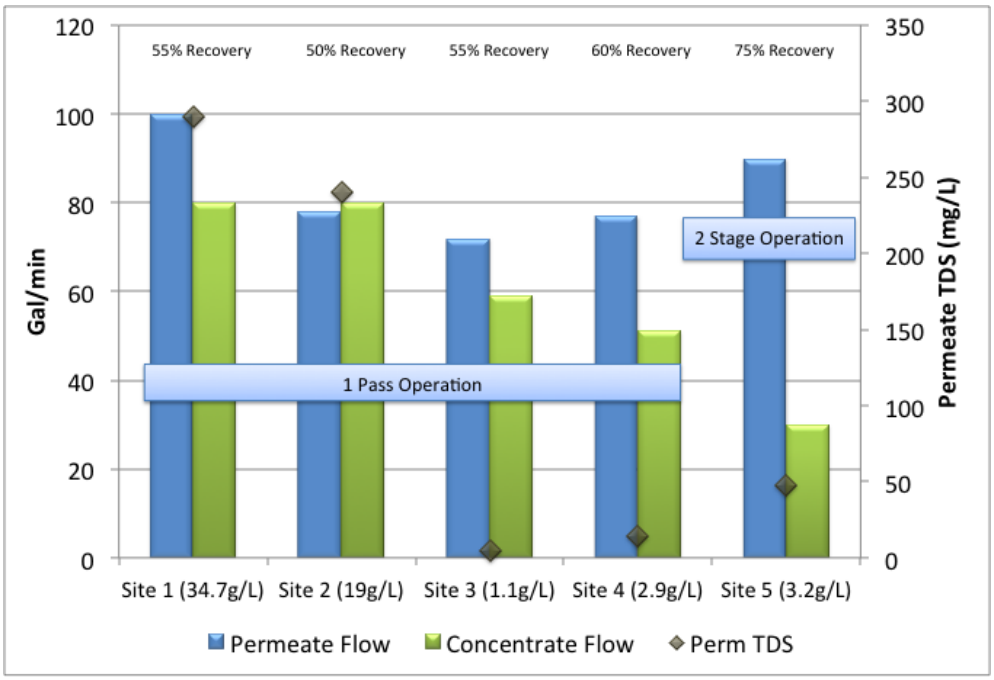
Contact: Michelle Chapman, (303) 445-2264

Variable Salinity Source Water Desalination

Need: Coastal communities may need to consider diverse water supply portfolios that include seawater, stormwater, and brackish groundwater, among others, as sources that can be used at different times of the year. These areas could benefit from a flexible treatment system that could achieve different rates of recovery based on water source and energy recovery.

Partners:
Bureau of Reclamation, Texas Water Development Board, & Southmost Regional Water Authority (SMRWA), Brownsville, TX, and Laguna Madre Water District, TX



Objective: Evaluate the power needs and water quality outputs associated with modifying a seawater Reverse Osmosis (RO) system to enable operation at 75 percent recovery when treating brackish water. The Expeditionary Unit Water Purifier (EUWP) has been demonstrated to achieve 40 to 60 percent recovery with one stage RO on seawater, river delta, brackish wastewater, and brackish groundwater (Sites 1-4 in the figure above, respectively). Testing was performed at the SMRWA Regional Desalination Plant, Texas (Site 5), to evaluate performance of the EUWP when reconfigured as a two-stage system at 75 percent recovery.

Results: Power use at 75 percent recovery was just what would be expected for the bulk osmotic pressure, 7.4 kW/kgal. Permeate water quality was comparable to the other sites. TDS was slightly higher than other brackish water sites due to the higher concentration of feedwater to the second stage.

Implications: Seawater systems designed with three trains can be converted to operate as two stage systems for treating brackish water sources. Piping allowances must be made to modify the hydraulics from one stage to two-stage operation easily. There is no power penalty. Permeate quality will be much better from brackish sources through a seawater membrane than seawater permeate thereby allowing for a greater blend ratio with other water sources.

Next step: Demonstrate the flexible feed source concept with a full-scale seawater desalination facility that has access to brackish water sources.