

# Study B

## Make reuse decisions reliable

Does a consistency check across flow, pressure and salt measurements improve accepted-water operation under unseen faults beyond a tuned normalization-based controller?

Candidate control contribution; novelty unresolved. This is a proposed study; no result or novelty is established.

## What earlier work establishes

RO normalization, predictive maintenance and automatic quality diversion are established. A prediction score or the use of AI is not the proposed contribution.

## The proposed difference

A frozen joint consistency rule decides whether the controller can trust its state estimate or must use a conservative fallback.

## A fair comparison

C0: tuned operating rules

C1: mechanistic, normalization-based control with fault fallback

T: C1 plus the prespecified joint consistency rule

## The decision

Qualifying delivered water per calendar operating time under the same quality and resource limits.

## Planned scope

18 development runs and 54 held-out confirmation runs across three controllers, three challenge families and six feed/time blocks; 288 principal panel equivalents.

## Before confirmation

A defined reuse service, authorized operating data, independent nonsalt quality methods and representative fault opportunities are required.

## Funding basis

12 funded months. Preliminary standalone estimate: lower \$1,263,787, base \$1,473,068, higher \$1,889,028. All studies use the same rates and cost rules, including founder coordination, scientific staff, analyses, equipment, institutional costs and reserve. These are unquoted planning estimates; shared execution requires an itemized combined scope.

## Methods and source review

Complete methods and reading limits · Editable unified budget

N01: ASTM D4516-19a: Standard Practice for Standardizing Reverse Osmosis Performance Data

N02: LG Water Solutions, Technical Service Bulletin 111: Data Logging and Performance Normalization

N09: Schwiebert et al., Turbidity-based scaling detection system for batch reverse osmosis combined with gypsum crystal recovery

N12: US9314742B2: Method and system for reverse osmosis predictive maintenance using normalization data

N32: WO2020223210A1: Docking station for mobile deionization trailers and related methods

N33: US5702582A: Multi-port multi-stream valve apparatus

S06: Membrane technology for water reuse in decentralised non-sewered sanitation systems: comparison of pressure driven (reverse osmosis) and thermally driven processes (membrane distillation and pervaporation)

S07: EPA: industrial reuse and fit-for-purpose treatment