Final Project Submission Form

Health Service: The Royal Children's Hospital

Title of project: *From Waste to Worth: A Sustainable Shift in Haemodialysis Water Use*	**Department:** Nephrology

Introduction

Provide a short introduction about yourself, your project, and why you were inspired to create sustainable environmental change in your department.

Following an environment sustainability workshop in 2023, the Paediatric Nephrologist initiated discussions with the Haemodialysis CNC and Head of Department of Nephrology to evaluate water usage in haemodialysis. An initial audit was undertaken in June 2023, quantifying total water consumption over one week of haemodialysis sessions.

Haemodialysis is a treatment for patients with severe chronic kidney disease, where a machine filters waste, toxins, and excess fluid from the blood – essentially replacing part of the kidney's function. Haemodialysis is lifesaving but it has a significant environment footprint because it must be done frequently and reliably. These footprints include high water consumption of which a large portion becomes wastewater, machine energy use that leads to a notable carbon footprint, and each treatment generated medical waste most of which is non-recyclable (e.g single-use plastic tubing, dialysers, needles and packaging).

Haemodialysis relies on a centralised Reverse Osmosis (RO) system, which produces ultrapure water for multiple dialysis machines within the unit. At the time of the initial audit, installation of a new central RO system was planned and subsequently completed in June 2024. In parallel, Technical Services were engaged to optimise system efficiency, and haemodialysis nursing staff implemented manual workflow adjustments to further reduce water usage.

Over a 12-month period, these combined interventions resulted in a substantial reduction in water consumption, from 2,778,828 litres to 994,872 litres.

What was the problem you tackled?

Audit findings confirmed that haemodialysis accounted for approximately 2% of the total hospital water use, representing a disproportionately high consumption and a clear target for sustainability improvement.

What was your SMART Goal?

To achieve a 50% reduction in haemodialysis-associated water consumption at RCH within 12 months following the implementation of a new Reverse Osmosis (RO) water treatment system, as measured by total unit water usage.

What system factors contributed to the problem?

As highlighted in sustainability frameworks such as *Towards Green Dialysis* and *Green Excellence in Dialysis*, outdated infrastructure was a key system factor contributing to excessive water use. In particular, the existing Reverse Osmosis system – being the primary

driver of water consumption in haemodialysis – was operating with suboptimal efficiency. The planned replacement of this ageing system presented a critical opportunity to improve water efficiency at a systems level.

Who were the key stakeholders?

Downer Facility Services, The Royal Children's Hospital (RCH), Day Medical Unit incorporating the RCH Haemodialysis Unit, and Department of Nephrology, RCH.

What was the intervention?

The intervention combined infrastructure optimisation with staff-led practice change. In collaboration with the Facility Manager (Downer) and RO providers, the original procurement plan was strategically revised to install a smaller, more water-efficient Reverse Osmosis (RO) system, configured to operate at optimal efficiency.

This was reinforced by targeted engagement of haemodialysis nursing staff, who implemented workflow changes to minimise unnecessary water use, including proactive manual shutdown of the RO system at the end of each day when clinically appropriate.

Together, these complementary interventions addressed both the primary system driver of water consumption and the day-to-day operational practices, enabling a sustained and measurable reduction in water usage.

What impacts/outcomes were measured? How did you measure them?

The primary outcome was the volume of water used by the haemodialysis unit.

Water consumption was tracked using the unit's water meter, allowing precise monitoring of total water usage over defined periods. This enabled direct comparison of consumption before and after the RO system upgrade and implementation of staff-led efficiency practices.

What challenges did you face? What enablers facilitated the change? What were the learning points?

A key challenge arose from the partial disconnect inherent in public-private partnerships, which can limit direct communication between healthcare providers and facility managers. This initially complicated the planning and decision-making process for upgrading the RO system.

Open collaboration and joint exploration of available RO solutions between RCH clinical staff and Downer enabled identification of a smaller, more water-efficient RO system that met both clinical and operational requirements.

This project highlighted the critical importance of frequent, transparent communication between clinical teams and facility managers in PP partnerships. Engaging stakeholders early and collaboratively ensures that sustainability initiatives are practical, implementable, and effective, and can lead to innovative solutions that might not have been identified in isolation.

What are the next steps with this project?

The next phase of the project focuses on strengthening the ongoing partnership with Downer to further enhance sustainability in haemodialysis. This includes exploring strategies for reusing or recycling reject water from the RO system and identifying additional opportunities to optimise water efficiency across the unit. By building on the collaborative framework established during the initial intervention, the team aims to implement sustainable, long-term solutions that can be embedded into routine practice.

Points will be awarded in the following categories:

Environmental sustainability: What were the carbon savings from your project? (Please include your raw data and calculations)

We had an annual reduction of 1,783,956 L (1 784 m^3/year) with change of RO system (2,778,828 L/year pre and 994,872 L/year post).

A relevant emission factor from the Australian Life Cycle Inventory (AusLCI) data released in 2023 estimated 2.26 kg CO_2-e per m^3 of water supplied and treated in Victoria. This factor included both energy for pumping, treatment and delivery, and associated upstream emissions from infrastructure.

CO_2-e saved = 1,783.956 m^3 x 2.26 kg CO_2-e per m^3 ≈ 4,035 kg CO_2-e per year. This is approximately 4 tonnes of CO_2-e avoided annually just from reduced water supply and treatment emissions.

Environmental sustainability: What were the waste reductions? (If possible, please specify what waste stream – reduced clinical waste by diverting to recycling, reduced clinical waste by using reusable equipment etc.)

This project primarily reduced the water waste stream associated with haemodialysis. Through the installation of a smaller, more efficient Reverse Osmosis (RO) system and implementation of staff-led operational changes, the unit reduced water consumption from 2,778,828 L to 994,872 L per year - a reduction of approximately 1.78 million litres annually.

This reduction in water use translates into an estimated carbon footprint avoidance of ~4.0 tonnes CO_2-e per year, including emissions associated with municipal water supply, treatment, and electricity for the RO system. While the intervention did not directly alter clinical waste streams (e.g., consumables or disposables), it represents a significant reduction in the environmental burden associated with the water resource and energy use, contributing to a more sustainable haemodialysis service.

Clinical outcomes: How did your project improve patient care? (include outcome data if available)

The project successfully maintained high standards of patient care while achieving significant water savings. Key clinical outcomes include:

- No compromise to water quality: The new RO system continues to meet ISO 23500-3:2019 standards for water for haemodialysis and related therapies.
- Patient safety maintained: There has been no increase in infection rates or other adverse clinical events since the intervention.
- Optimal dialysis delivery: All haemodialysis sessions continued without interruption, ensuring effective treatment and patient outcomes were preserved.

This demonstrates that sustainability interventions in haemodialysis can be implemented without negatively impacting patient care, achieving both environmental and clinical objectives.

Financial sustainability: Have there been any financial savings? (please include your calculations)

The cost of the system upgrade was approximately $250,000.

Based on average non-residential water usage rate of approximately $3.17 per kilolitre (data published by Yarra Valley Water for 2025-26), the 1,784 kL annual reduction in water use is estimated to have saved ~ $5655 in water costs per year excluding fixed supply charges.

Social sustainability: How did your project socially benefit patients, staff, or wider community?

This project promoted a culture of environmental awareness and shared responsibility within the haemodialysis unit. Through targeted education, staff developed a greater understanding of water usage in routine clinical care and its environmental impact.

This increased awareness translated into behavioural change, with staff becoming more mindful of resource use in day-to-day practice. Importantly, the initiative also empowered staff to actively contribute ideas for further sustainability improvements, fostering a sense of ownership and engagement in delivering greener care.

These changes support a broader shift towards sustainable healthcare practices, benefiting not only the immediate clinical environment but also the wider community through reduced environmental impact and more responsible resource use.

Generalisability: Could this project be replicated in other areas of the hospital?

While the opportunity to replace a central Reverse Osmosis (RO) system is relatively infrequent, this project demonstrates that significant sustainability gains can be achieved when such opportunities arise and are actively leveraged.

The intervention highlights the importance of clinical engagement in infrastructure and procurement decisions, showing that clinician-led input can drive meaningful environmental improvements. This approach is transferable to other areas of the hospital where equipment upgrades or replacements are planned.

In larger haemodialysis units, where equipment replacement occurs more regularly, there is even greater potential to embed sustainability considerations into purchasing decisions, amplifying the environmental impact.

Overall, this project is generalisable as a model of proactive, multidisciplinary collaboration, encouraging healthcare services to integrate sustainability into both operational practices and equipment procurement planning.

Please attach some photos of you and your team undertaking this project


GAMBRO


SANDY
EMMA
ZOE
ANNA
MATTERS


W1-2S1-CB30
VANTIVE Phone Number for RO and HD
Machine Faults Business and After Hours:
1800 920 133
2/4/2026 13:25
CONTACT DOWNER ON 1300664579 FOR SERVICE
EVERY DROP
MATTERS
PLEASE TURN OFF THE RO AT END OF DAY
OR WHEN NOT IN USE