



Bathrooms of the Future - pilot study

Prepared for Sydney Water and Caroma

**Institute for
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About the authors

The Institute for Sustainable Futures (UTS-ISF) is an interdisciplinary research and consulting organisation at the University of Technology Sydney. ISF has been setting global benchmarks since 1997 in helping governments, organisations, businesses and communities achieve change towards sustainable futures. We utilise a unique combination of skills and perspectives to offer long term sustainable solutions that protect and enhance the environment, human wellbeing and social equity.

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Executive Summary

This report presents the research from a joint project on ‘Smart Devices and Intelligent Buildings; Bathrooms of the Future’ conducted by the Institute for Sustainable Futures at the University for Technology Sydney (UTS-ISF) with Sydney Water and GWA Caroma. The project was Stream 1 of a large research program that sought to explore how smart technologies might transform water use practices in commercial buildings and homes in Greater Sydney over the next ten years. The focus of each Stream was:

- Stream 1: A trial of smart bathroom fixtures in a commercial building to test their capacity to improve water and energy savings (with UTS-ISF, Sydney Water and GWA Caroma).
- Stream 2: An exploration and visualisation of how smart water technologies could transform water use practices in the homes of the future in Greater Sydney across diverse communities (with UTS-ISF and Sydney Water).
- Stream 3: A synthesis event of the prior two streams that considers the implications of disruptive in-building digital water technologies and identifies steps forward across the water industry.

As digital plumbing technologies become more available and sophisticated in their functionality, there is growing consensus that these ‘smart bathroom’ technologies can have a significant impact in shaping water conservation and building management. However, there is lack of clear understanding on exactly how the large volume of data available from each device can be assimilated and analysed to provide meaningful insights into water use behaviors and enable new water conservation actions.

Stream 1 addresses this gap by performing a deep dive into the insights and implications that can be derived from activation and usage data from digital fixtures (toilets, urinals, basin taps and showers) alongside corresponding bathroom-level high resolution smart meter data.

Data spanning from January to December of 2022 was collected from the three bathrooms (Female, Male, Disability Discrimination Act compliant (DDA)) on level three of the commercial building in Rhodes. We demonstrated that smart command fixtures allow for novel insights on end-use behavior, including the ability to:

- Disaggregate and quantify bathroom level usage by fixture type. For example, WC (water closet / toilet) usage accounts for 91% and 73% of total water use for female and male bathrooms respectively.
- Disaggregate fixture usage by individual location. For example, toilets furthest away from the bathroom entry typically exhibit lower half flush rates. Such insights can provide a deeper understanding of usage behavior and improve future bathroom design.
- Derive and identify hygiene and efficiency KPI’s, including tap usage per visit, average water use per visit, and half-flush rates.
- Estimate excess water consumption of each device, flagging potential hardware inspections and maintenance requirements.

Based on the demonstrated insights, we established two applications of smart bathroom monitoring that are only possible with the combined insights from fixture-level monitoring and granular smart meter data:

- a behavioral intervention assessment that quantifies the impact of water conservation signage on end-use water consumption, and
- a hydrological assessment that quantifies the impact of water pressure on excess water consumption for different fixtures.

Based on the learnings, recommendations for each of the key stakeholders (GWA Caroma, Sydney Water, and building owners / managers) have been provided.