

W-Lab Technology Roadmap

2022 Edition



The W-Lab Vision

Water Services Association of Australia through W-Lab brings together a specialist network of water experts, innovators and utilities, leveraging technology to secure the future of the industry. It bridges the gap between innovation and the water utilities by leaning on our network's knowledge and expertise to inspire confidence.

We have collaborated with members from our diverse network across Australia and New Zealand, including large, small, regional and council water utilities to create our vision of a new water future:

- That is co-created by customers and utilities;
- Where water, energy, waste, telecommunications and agriculture are integrated; driven by communities and enabled with technology;
- Where closing the loop has created new economies;
- That gives back to nature, enabling thriving communities.

This Roadmap is our guide, to keep us on track to reach our vision and enable our partners and collaborators to see where we are heading. It will guide how water utilities in Australia and New Zealand approach technology and innovation and leverage their collective knowledge, expertise and resources to solve current and emerging challenges. The Roadmap is a dynamic document that will change as members address key challenges, learn, adapt and move into new areas.

What value will the Roadmap deliver?

Success means W-Lab Members will...

1. Lower costs through innovative approaches to maintain and modernise our infrastructure.
2. Remain relevant as an equitable provider of essential services in our regions.
3. Deliver to ever-evolving customer expectations in service delivery and care for the environment.
4. Improve the safety and wellbeing of our workforce.
5. Respond to increased climate variability and population growth.



Understand and support the diverse needs of our customers



Meet community needs through decentralised solutions



Collaborate across sectors and share insights from data with partners and communities



Empower customers to take control of water use in their homes



Improve operations through automation and data-driven insights



Keep our people safe and well



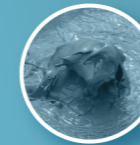
Use data to better understand our customers and communities



Track our progress towards net zero



Actively reduce our carbon footprint



Explore new markets and recover value from waste

Year 3 and 4 showcase order 1 2 3 4



Integrate natural systems and solutions for improved water management



Monitor and measure water quality



Improve asset management to protect the environment



Limit our extraction of freshwater from the natural environment

Where the sector is co-created by customers and utilities.

Where various sectors are integrated, driven by communities and enabled with technology.

Where closing the loop has created new economies

Where giving back to nature, enables thriving communities

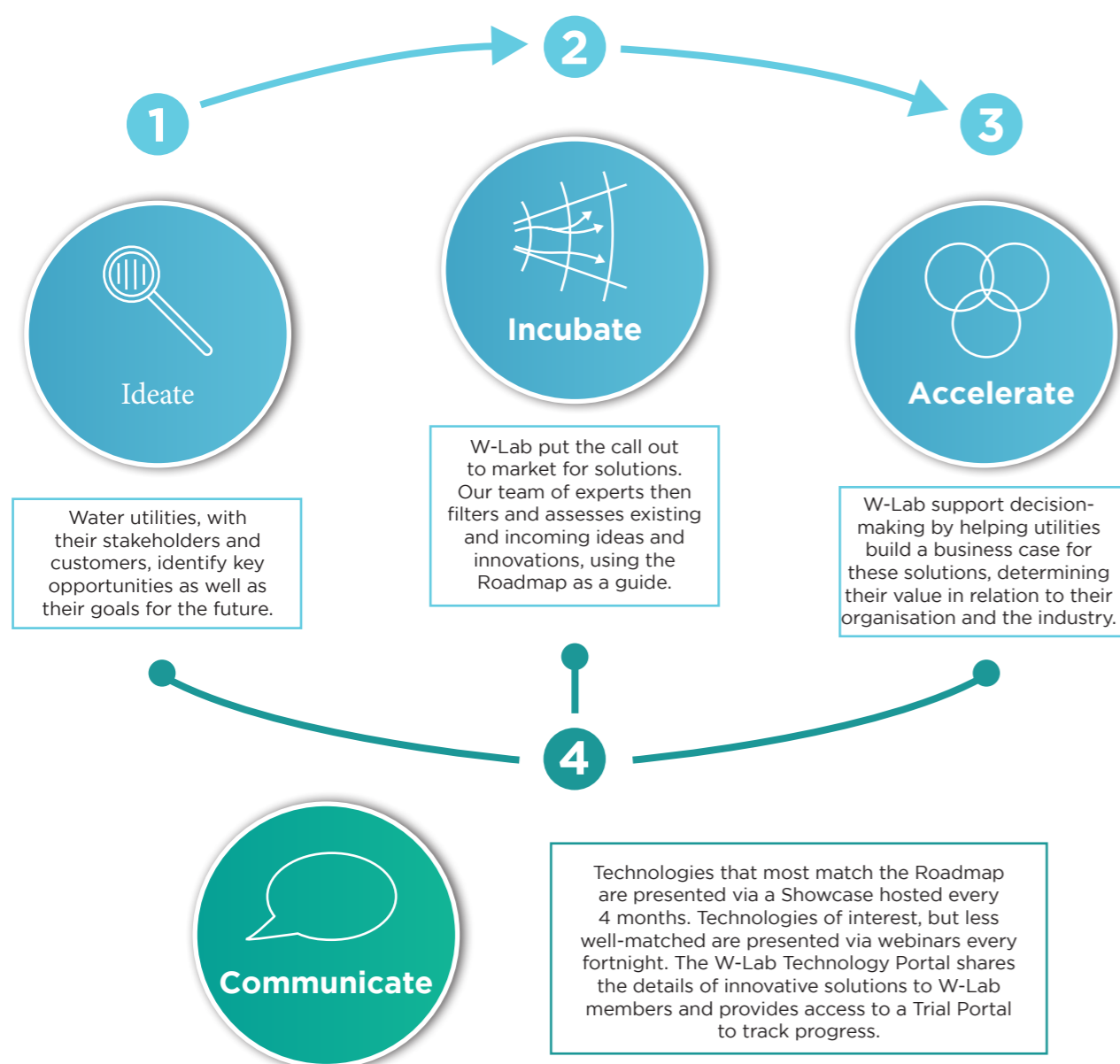
A New Water Future

How W-Lab Works

W-Lab will achieve this co-created vision through a new way of consolidating industry knowledge and insights, allowing utilities to steer the course of innovation. By empowering utility stakeholders, W-Lab creates champions and change-makers in industry.

W-Lab will scout for technologies and solutions that have the most potential to progressively propel the industry to fulfill our collective vision. Water utilities collaborate in evaluating and trialling solutions. W-Lab will help utilities build the business case for solutions with the most potential.

W-Lab has four stages



How are technologies sourced?

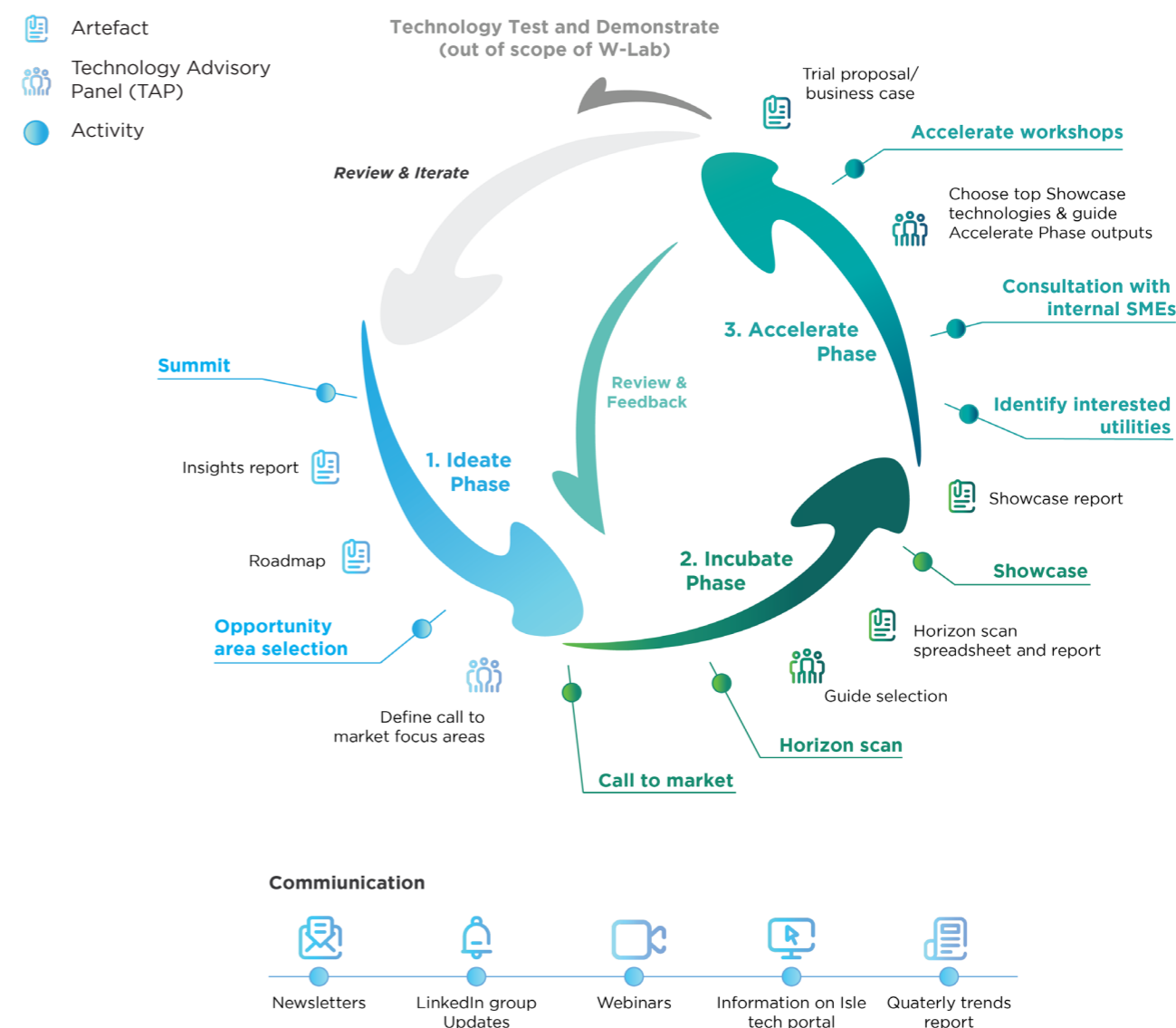
W-Lab provides a invaluable point of entry into the Australian and New Zealand water industry using an invaluable evaluation process that aligns with member requirements. Through our "Call to Market" documents - W-Lab helps technology vendors navigate their market entry with clear guidelines and actionable insights. W-Lab ensures that the time, effort and resources devoted by utilities and technology vendors generates clear outcomes.

How are technologies presented?

Technologies that have the greatest potential are invited to present at one of three Showcase Events hosted annually. Technologies that are still of interest but not showcased may apply for a subsequent opportunity area where there is overlap and can be featured through W-Lab's fortnightly webinar series. All reviewed technologies have a profile created on our Technology Portal, for anytime ease of access.

Technology Advisory Panel

For each showcase area, W-Lab will employ a Technology Advisory Panel (TAP), consisting of subject matter experts, business leads, and end users to provide ongoing feedback in order to tailor technologies to closely match member requirements. The TAP will support the Isle team in defining the call to market, focusing the horizon scan, evaluating solutions and providing feedback to progress the vision within the Technology Roadmap.



Pillars of Intent

Ideate

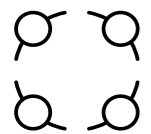


Align the Roadmap to achieve customer-centric outcomes.

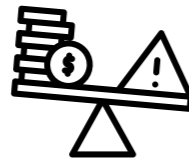


Address business risks by converting them into strategic opportunities for innovation.

Incubate



Bring leading technology and innovation practices from other industries to the water sector.

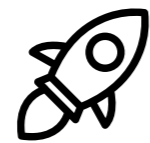


Understand the risk tolerance from the business and how they apply across the opportunity areas.

Accelerate

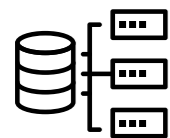


Link the value proposition from innovative and emerging technologies across the globe to strategic business outcomes in Australia and New Zealand.

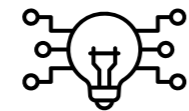


Consider the role that W-Lab could play in developing emerging technology, including incubation of start-ups.

Communicate



Provide information to enable executives to make appropriate decisions.



Greater integration of W-Lab within the organisations

What are the Opportunities?

Each water utility's individual challenges are, of course, unique - however, experience shows us that many of these challenges are also shared by others in the industry, from the smallest to the largest organisations. We aim to explore a mix of opportunities across core, adjacent and transformational innovation areas. This will enable all members to participate and see value in W-Lab regardless of where they are on their innovation journey.

Core technologies enable strengthening of core business, adjacent technologies move into adjacent areas whilst maintaining cost and practicality. Transformational technologies are those looking to transform current practices, based on understanding future challenges and maintaining flexible strategies.

Showcases

2022-2023 Showcase Areas



October 2022



Actively reduce our carbon footprint



March 2023



Keep our people safe and well



July 2023



Integrate natural systems and solutions for improved water management



November 2023



Empower customers to take control of water use in their homes



2020-2021 Showcase Areas

November 2020



Explore new markets and recover value from waste

March 2021



Limit our extraction of freshwater from the natural environment

June 2021



Create insights from data to inform our decisions and share with others

September 2021

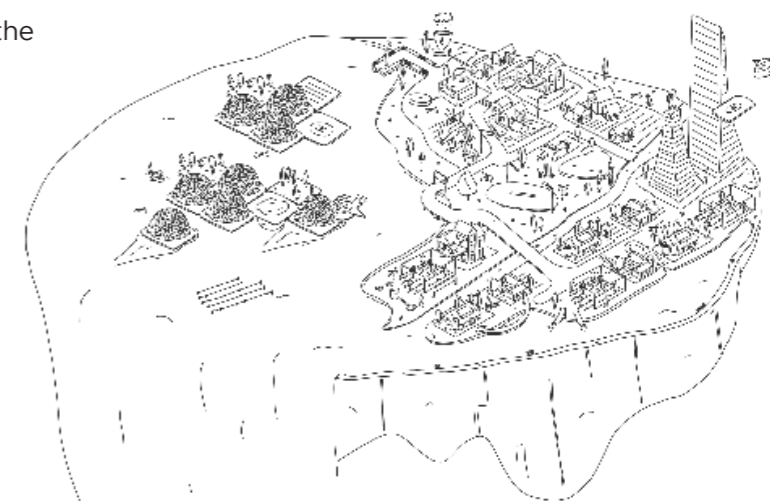


Understand and support the diverse needs of our customers

Future State Narratives

The roadmap vision and future state narratives

These future state narratives created by W-Lab Members form the basis of the vision we are working towards. These narratives provide the different lenses to view our challenges and provide the framework for the segments of the Roadmap.



Customer: A new water future co-created by customers and utilities.

Changes to our customers' needs, increased awareness of and activism on climate change, an appreciation of the increasing value of water led us to innovate. All stakeholders wanted increased sustainability. We needed to do more with less and we needed to engage the customer and community in this, recognising that our impact and benefit reaches beyond bill-paying-customers to the wider community.

We've realised we can learn as much from our customers as they can learn from us. Customers now have more knowledge and a more intimate relationship with the water and wastewater cycle. They have direct visibility on the effects of additional contributions they make and understand environmental and financial implications of their informed choices.

We continue to operate from a great basis of trust, and we've tested this as we developed new innovative solutions (inc digital, use of data) for individuals and communities. There is now a two-way value exchange between us and the customer as they contribute resources to the system, and we are better able to understand their needs.

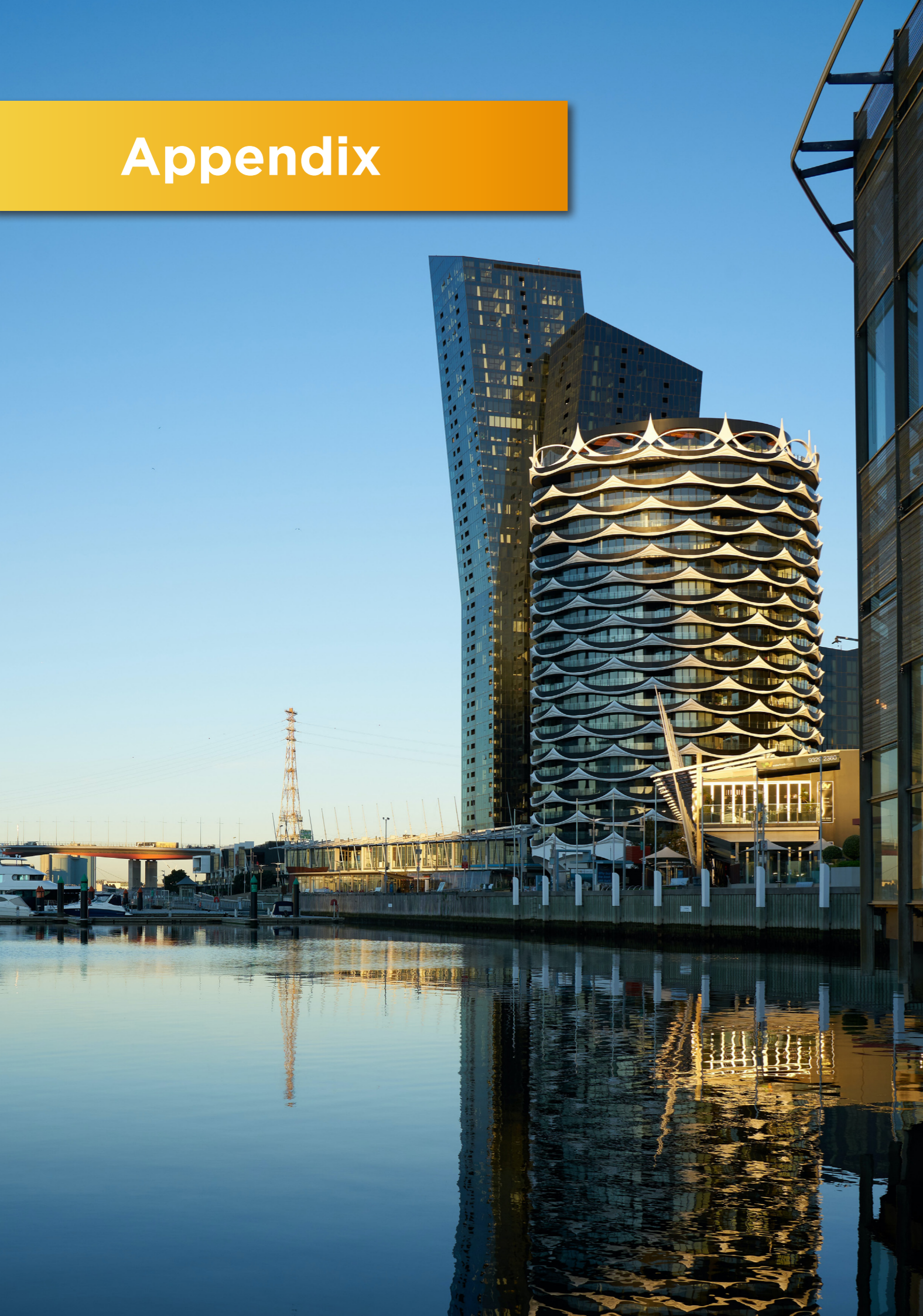
As more technologies were introduced near/into the home, we balanced the feeling of choice and perception of being controlled. Customers see value in these solutions as they are empowered to self-manage their behaviour and make the most of the water resource.

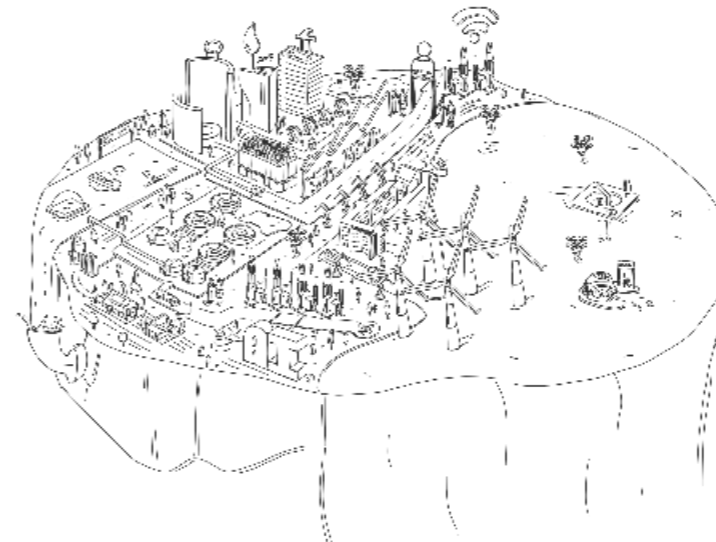
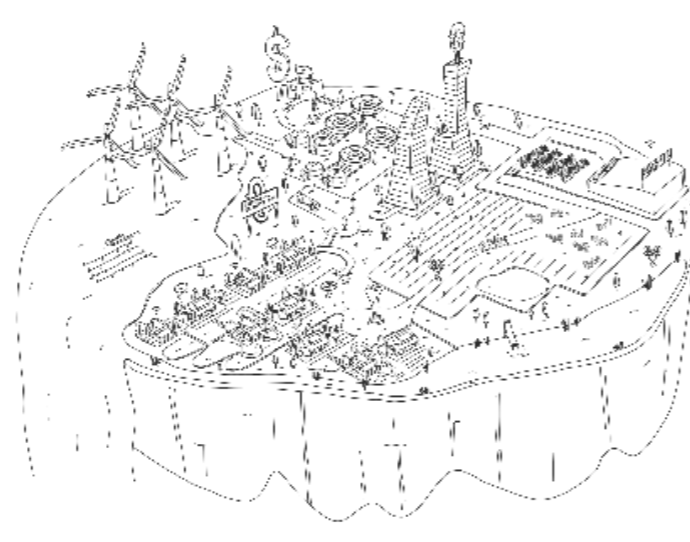
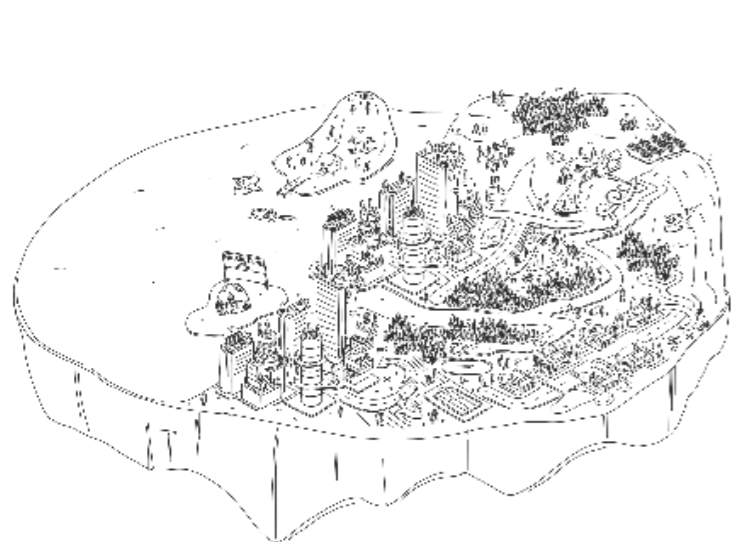
We elevated our communication and engagement with customers and developed common and consistent digital platforms to do so. We give them information at the level they require, recognising that some want more (open dialogue on how water affects their personal health, choice, detail on water composition etc) and others prefer a set and forget as long as it is 'safe'. Our differentiated services and technology allow us to better meet the needs of vulnerable and hardship customers.

Our collaboration with industrial customers has reached new highs, finding synergies through data sharing, resource recovery and emerging markets has yielded better outcomes for the community.

We've been successful as we engaged early with regulators to collaboratively innovate and trial new technologies and services.

Appendix





Nature:

A new water future that gives back to nature, enabling thriving communities.

It is not enough to do no harm to the environment. Our future water systems give back to nature and communities whilst also ensuring sustainable water sources for future generations. Our communities are benefiting through cooling, cleaner air, more activity and better overall wellness. We have shifted our mindset from building pipes and tanks to leveraging from the natural systems around us, becoming generators rather than consumers. We are sustaining and improving the natural environment through the application of technologies which are inspired by nature itself. Our natural systems are restored.

Our net environmental footprint (water, energy, carbon, waste, etc.) and impact are positive through the entire water cycle. We draw nothing new. We create value by optimising limited resources.

We take a holistic/integrated view across systems, maximising resource use and recovery, and are inspired by First Nations knowledge. We give to culture without impacting culture.

Flows:

A new water future where closing the loop has created new economies and enabled carbon neutrality.

In a drive to close the loop and stop the 'leaking' of resources from our industry ecosystem, waste is no longer an unrealised value. We are committed to a water-energy-waste nexus and work within the carrying capacity of nature.

We are not just 'growing potatoes on Mars', we have created new markets, products and industries. New industries have yielded new workforce opportunities and demanded training and growth of new skill sets. Producers are collaborating across industries, institutions and supply chains to ensure that whatever is left from production derives additional value.

We operate in synergy with natural cycles through an integrated system where our stakeholders - customers, communities, regulators, suppliers, operators, innovators - are all part of the journey. Communities are key players in resource trading and green processes.

We tackle challenges around minimising the industry's carbon footprint, optimising energy use, and exploring the use of renewables.

Enterprise:

A new water future where water, energy, waste, telecommunications and agriculture are integrated, driven by communities and enabled with technology.

Water and resources are precious. We are a large employer and contribute to the economy as an essential service. We keep building trust and an understanding with the community of the complexity of managing this resource. Our goals have changed from providing a service to creating prosperous and healthy communities.

In this future, all water, energy, waste, agriculture and telecommunication services are integrated. Technology advancement has enabled off-grid solutions to complement these integrated solutions. Infrastructure won't provide one function, it is used collectively to make our cities greener, more sustainable and liveable. Different players are all working together, not restrained to any one part of the workflow. Revolutionary digital transformation removes the barriers and enables collaboration and co-planning. High quality and high-resolution data is collected and standardised. They provide confidence and empowerment for decision making and enable the ability to integrate across sectors.

Community, regulator, councils, utilities and industry are all working together towards the same goal and managing similar complexities such as climate change and population growth. Adaptive planning is key and there is an overarching holistic approach in governance. There is long term commitment and stability across our goals. We are agile in our response (workforce agility and flexibility) in order to take advantage of these opportunities.

W-Lab Calendar 2022-2024

W-Lab Calendar

2022 Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec 2023 Jan Feb Mar Apr May Jun Jul Aug Nov Oct Nov Dec 2024 Jan Feb Mar

● **Recap Event** ● **Ideation Summit**

Member Interviews

Technology Roadmap

Flows Frame

A new water future where closing the loop has created new economies

1 Call to market & council meetings

Showcase

Technology adoption opportunities/
Accelerator workshops

Enterprise Frame

A new water future where water, energy, waste, telecommunications and agriculture are integrated, driven by communities and enabled with technology.

3 Call to market & council meetings

Showcase

Technology adoption opportunities/
Accelerator workshops

Nature Frame

A new water future that gives back to nature, enabling thriving communities.

2 Call to market & council meetings

Showcase

Technology adoption opportunities/
Accelerator workshops

Customer Frame

A new water future co-created by customers and utilities.

4 Call to market & council meetings

Showcase

Technology adoption opportunities/
Accelerator workshops

Ongoing communication activities: Technology portal, tech tools, webinars, newsletters

Flows Opportunities

The Opportunities

The following pages include a more detailed deep dive into the 'how might we' areas identified in the main document and roadmap. Additionally, there are categorised innovation interests outlined by W-Lab members during the 2022 Ideation Summit.

As previously mentioned core technologies enable strengthening of core business, adjacent technologies move into adjacent areas whilst maintaining cost and practicality. Transformational technologies are those looking to transform current practices, based on understanding future challenges and maintaining flexible strategies.

TECHNOLOGY OPPORTUNITY AREAS



How might we actively reduce our carbon footprint?



Number of interested utilities

| | Almost All | Many | Some |
|-----------------------------|--|---|---|
| Core Innovation | <ul style="list-style-type: none"> Low/zero carbon water and wastewater treatment solutions Enhanced biogas recovery Optimise energy use of energy-intensive assets e.g. pumps, blowers, aerators | <ul style="list-style-type: none"> On-site electricity generation from existing assets Sludge reduction | <ul style="list-style-type: none"> Revegetation and soil carbon storage |
| Adjacent Innovation | <ul style="list-style-type: none"> Electricity generation from renewable energy sources e.g. wastewater heat, solar, hydropower, etc Hydrogen generation | <ul style="list-style-type: none"> Carbon capture and sequestration An effective database/tool for alternative material | <ul style="list-style-type: none"> Floating solar Co-digestion of sludge for energy self-sufficiency |
| Transformational Innovation | <ul style="list-style-type: none"> Reduce fugitive emissions Energy storage | <ul style="list-style-type: none"> Manage energy demand in the treatment process Recycled materials for construction | <ul style="list-style-type: none"> Redesign treatment plants and assets Infrastructure that can be 100% repurposed recycled |

TECHNOLOGY OPPORTUNITY AREAS



How might we explore new markets and recover value from

Number of interested utilities

| | Almost All | Many | Some |
|-----------------------------|--|---|--|
| Core Innovation | <ul style="list-style-type: none"> Biosolids to fertiliser Nutrient and struvite recovery | <ul style="list-style-type: none"> Decentralised grey water treatment | <ul style="list-style-type: none"> Source separation of waste e.g. urine diversion |
| Adjacent Innovation | <ul style="list-style-type: none"> Biochar and advanced carbon materials High value products from waste e.g. alum sludge, sand from grit separation, cellulose | <ul style="list-style-type: none"> Advanced biosolid treatment for PFAS, microcontaminant removal Mapping waste to identify high value waste stream | <ul style="list-style-type: none"> Oxygen generation Commercial services and community recovery centers |
| Transformational Innovation | <ul style="list-style-type: none"> Energy recovery eg. hydrogen and other energy products Bio-refinery and zero waste | <ul style="list-style-type: none"> Integrating with food and agriculture Biosolids to building materials eg. concrete, aggregate, bricks Bioplastics | <ul style="list-style-type: none"> Rare high value materials recovery Use of Fat, Oil, Grease (FOG) as biofuel |

TECHNOLOGY OPPORTUNITY AREAS



How might we track our progress towards net zero?

| | | Number of interested utilities | | |
|-----------------------------|---|--|--|------|
| | | Almost All | Many | Some |
| Core Innovation | <ul style="list-style-type: none"> Measure gas concentrations at specific locations e.g. video imaging, laser, etc | <ul style="list-style-type: none"> Measure emissions across a site e.g. satellites, drones, etc | <ul style="list-style-type: none"> Monitor effectiveness of carbon offset schemes | |
| Adjacent Innovation | <ul style="list-style-type: none"> Notify and quantify Scope 1 & 2 emissions in real time Monitor operational energy usage and optimisation | <ul style="list-style-type: none"> Monitor biogas generation efficiency | <ul style="list-style-type: none"> Track Scope 3 emissions | |
| Transformational Innovation | <ul style="list-style-type: none"> Energy demand analysis Identify fugitive emissions | <ul style="list-style-type: none"> Process simulation and digital twins Whole of life emissions analysis for infrastructure eg. dams | <ul style="list-style-type: none"> Predictive modelling of GHG emissions | |

Enterprise Opportunities

TECHNOLOGY OPPORTUNITY AREAS



How might we keep our people safe and well?

Year 4

 Showcase Area

Number of interested utilities

| | Almost All | Many | Some |
|-----------------------------|--|---|--|
| Core Innovation | <ul style="list-style-type: none"> Robotics to perform high risk activities eg. caged drones/UAV, confined space robots Design of alert system to identify safety issues easily Hazard reduction and prevention Safe working tools | <ul style="list-style-type: none"> AR/VR for training Contractor management platforms Monitoring pollution (air, sound, odour, etc.) | <ul style="list-style-type: none"> Machine vision and video recognition Virtual tools/platforms for H&S inductions |
| Adjacent Innovation | <ul style="list-style-type: none"> Digital site risk assessments Process automation to reduce injury | <ul style="list-style-type: none"> AR for field operations Workforce mobility and incident management platforms | <ul style="list-style-type: none"> Wellbeing and mental health platforms Ergonomic factor assessments - Assess impact of incentives on safety |
| Transformational Innovation | <ul style="list-style-type: none"> Knowledge management and retention | <ul style="list-style-type: none"> Wearables that alert user to hazards CMMS analysis for incidence tracking | <ul style="list-style-type: none"> Collaborative robots to assist humans with difficult tasks |

TECHNOLOGY OPPORTUNITY AREAS



How might we improve operations and decision-making through automation and data-driven insights?

Number of interested utilities

| | Almost All | Many | Some |
|-----------------------------|---|---|---|
| Core Innovation | <ul style="list-style-type: none"> Using IoT to collect data Smart meters and sensors Hazard reduction and prevention | <ul style="list-style-type: none"> Displaying data visually through dashboards and spatial platforms Tools for data reporting | <ul style="list-style-type: none"> Data processing and analytics for informed decision making and KPI management |
| Adjacent Innovation | <ul style="list-style-type: none"> Pipe replacement programs/regimes Process automation AI/ML for operational intelligence and treatment, network optimisation | <ul style="list-style-type: none"> Predictive analysis for minimising risk of spot anomalies (pipe bursts, sewer spills, blockages, etc) Predict events and changes of water quality and quantity to inform WTP operation | <ul style="list-style-type: none"> Adaptation planning tools for assets in response to climate change Predictive maintenance |
| Transformational Innovation | <ul style="list-style-type: none"> Sharing open data sets to the public for education and information as well as generate value Tools to easily integrate different data sources from different systems | <ul style="list-style-type: none"> Centralised platform for securely collating information across utilities Cybersecurity | <ul style="list-style-type: none"> Root cause analysis/ causal factor identification Automate data extraction using natural language processing |

TECHNOLOGY OPPORTUNITY AREAS



How might we use data to understand the diverse customer and community needs and provide value to them?

Number of interested utilities

| | Almost All | Many | Some |
|-----------------------------|--|---|---|
| Core Innovation | <ul style="list-style-type: none"> Smart meters and sensors, link to portal or customer interface to inform customer Leak detection as a way to better serve communities | <ul style="list-style-type: none"> Using IoT to collect data Using data analytics, ML and AI | <ul style="list-style-type: none"> Ongoing monitoring, automated analytics to provide insights to understand community and optimise operations |
| Adjacent Innovation | <ul style="list-style-type: none"> AR and VR for customer information and engagement | <ul style="list-style-type: none"> Use power in streetlights to power sensor and existing network to transmit data | <ul style="list-style-type: none"> Calibration of sensors - automated checking and recalibration |
| Transformational Innovation | <ul style="list-style-type: none"> Preventative health Community safety Cross industry collaboration data and insight sharing platforms | <ul style="list-style-type: none"> Social media sentiment analysis | <ul style="list-style-type: none"> Wastewater epidemiology eg. COVID and drug testing |

Nature Opportunities

TECHNOLOGY OPPORTUNITY AREAS



How might we integrate natural systems and solutions for adaptation in improved water management?

Year 4
 Showcase Area

Number of interested utilities

| | Almost All | Many | Some |
|-----------------------------|--|--|---|
| Core Innovation | <ul style="list-style-type: none"> Integrated water management Blue-green infrastructure to handle run-off | <ul style="list-style-type: none"> Tools to prioritise where to undertake blue-green infrastructure interventions eg. spatial, VR | <ul style="list-style-type: none"> Algae bloom remediation in catchments |
| Adjacent Innovation | <ul style="list-style-type: none"> Nature-based solutions for improved water quality and climate resilience Hydraulic modelling to evaluate current water levels and future worst-case scenarios in response to climate change | <ul style="list-style-type: none"> Tools to demonstrate livability benefits of blue-green infrastructure Treatment solutions that minimise chemical use Adaptation planning tools in response to climate change | <ul style="list-style-type: none"> Advanced treatment to address emerging contaminants eg. PFAS, micropollutants |
| Transformational Innovation | <ul style="list-style-type: none"> Biomimicry Green chemistry Integrated urban design eg. urban cooling | <ul style="list-style-type: none"> Smart control systems e.g. passive systems or smart systems | <ul style="list-style-type: none"> Improved integration of services (power, water, telecommunication, etc) |

TECHNOLOGY OPPORTUNITY AREAS



How might we limit our extraction from the natural environment?

Number of interested utilities

| | Almost All | Many | Some |
|-----------------------------|---|--|---|
| Core Innovation | <ul style="list-style-type: none"> Leak location and management Optimise water use, minimise water loss in treatment processes eg. backwash | <ul style="list-style-type: none"> Bulk water metering accuracy Optimise the use of traditional water sources Dynamic pressure management in water supply network | <ul style="list-style-type: none"> Water sharing |
| Adjacent Innovation | <ul style="list-style-type: none"> Alternative water sources/supply e.g. atmospheric water, greywater, rainwater, local "fit for purpose" supply, etc Purified recycled water for non-potable use | <ul style="list-style-type: none"> Maximise the potential of stormwater Low cost water quality sensors for alternative water sources | <ul style="list-style-type: none"> Desalination optimization |
| Transformational Innovation | <ul style="list-style-type: none"> Purified recycled water for potable use | <ul style="list-style-type: none"> Identify best source of water for efficient water treatment eg. blending water | <ul style="list-style-type: none"> Aquifer recharge |

TECHNOLOGY OPPORTUNITY AREAS



How might we monitor and measure water quality?

| | | Number of interested utilities | | |
|-----------------|--|--|--|------|
| | | Almost All | Many | Some |
| Core Innovation | <ul style="list-style-type: none"> Water quality monitoring and online remote sensing | <ul style="list-style-type: none"> Network of weather monitoring Satellite, drones, environmental DNA (new methods) | <ul style="list-style-type: none"> Digital twin Riverine canopy monitoring in GIS | |
| | <ul style="list-style-type: none"> Increased real time sensors for identifying presence of nutrients (TN, N species, total P) + pathogens | <ul style="list-style-type: none"> Identification of contaminants of emerging concern (CEC) Predictive and retrospective algae bloom modelling | <ul style="list-style-type: none"> Modelling of environmental health Low cost sensors for natural assets | |
| | <ul style="list-style-type: none"> Monitor carbon and nutrient offsets over time Sensors and real time control of natural assets for performance and maintenance | <ul style="list-style-type: none"> Monitor groundwater levels | <ul style="list-style-type: none"> Model and quantify liveability benefits of blue-green infrastructure eg. identification of protected flora fauna, biodiversity | |

TECHNOLOGY OPPORTUNITY AREAS



How might we improve asset management to protect the environment?

| | | Number of interested utilities | | |
|-----------------|---|--|---|------|
| | | Almost All | Many | Some |
| Core Innovation | <ul style="list-style-type: none"> Automated condition monitoring on assets Remote sensing to monitor water/wastewater leaks eg. drones, satellites | <ul style="list-style-type: none"> Improved water quality and reduced sludge buildups in sewage lagoons | <ul style="list-style-type: none"> Infrastructure to protect against adverse weather events eg. floods, bushfire, droughts | |
| | <ul style="list-style-type: none"> Monitor quality of effluent discharge to meet regulatory requirement Measure and control H2S in sewers | <ul style="list-style-type: none"> Monitoring environmental pollution around treatment plants (sound, odour, GHG emissions, light etc.) | <ul style="list-style-type: none"> Condition monitoring of reservoirs, tanks, and dam safety | |
| | <ul style="list-style-type: none"> Predictive analysis of asset failure | <ul style="list-style-type: none"> Restoring environment by putting freshwater back | <ul style="list-style-type: none"> Zero liquid discharge/ Minimal liquid discharge | |

Customer Opportunities

TECHNOLOGY OPPORTUNITY AREAS



How might we empower positive customer behaviour so that they can take control of water use in their homes?



Number of interested utilities

| | Almost All | Many | Some |
|-----------------------------|--|--|--|
| Core Innovation | <ul style="list-style-type: none"> Water efficiency devices for homes and businesses Customer platforms that provide easy-to-understand insights on their water usage | <ul style="list-style-type: none"> Effective science communication and education around water literacy eg. value of water, alternate sources, long term water security, sustainability literacy, etc | <ul style="list-style-type: none"> Getting community ownership / buy in / invested into the "water cycle" Report averages across customer segments to provide benchmarks |
| Adjacent Innovation | <ul style="list-style-type: none"> Customer platforms to show real time savings depending on amount being used IoT sensors for identifying non-technical leaks, theft of water | <ul style="list-style-type: none"> Gamification to improve water usage in schools, households and commercial areas Gamification for educating customers about affordability Gamification to influence customer decision making and behavioural change Gamification in the home using smart meters where possible | <ul style="list-style-type: none"> New methods of billing and payment Data security and privacy |
| Transformational Innovation | <ul style="list-style-type: none"> Customer platforms for proactive communication and alerts to excessive water usage or leakages | <ul style="list-style-type: none"> Smart sensors that integrate with smart homes Enable customer to measure their impact to the environment and how they contribute to positive outcomes, giving them control, ownership and choice | <ul style="list-style-type: none"> Alternative water sources eg. green spaces, lakes to meet community needs |

TECHNOLOGY OPPORTUNITY AREAS



How might we meet community needs through decentralised solutions?

Number of interested utilities

| | Almost All | Many | Some |
|-----------------------------|--|--|--|
| Core Innovation | <ul style="list-style-type: none"> Decentralised grey water treatment Point-of-use water treatment | <ul style="list-style-type: none"> Modular systems to cope with varying demands Renewable energy powered/off-grid decentralised treatment facilities | <ul style="list-style-type: none"> Alternative water sources monitored and managed by utility |
| Adjacent Innovation | <ul style="list-style-type: none"> Optimising and advancing rainwater capture | <ul style="list-style-type: none"> Community farms Decentralised composting facilities | <ul style="list-style-type: none"> Technologies to pool energy generation and distribute as demanded, eg. community solar batteries Automated technology that the community can operate and maintain |
| Transformational Innovation | <ul style="list-style-type: none"> Unique/ new business models for residential and commercial services Decentralised, non-sewered wastewater treatment/ Sewer mining | <ul style="list-style-type: none"> Decentralised wastewater treatment plants with resource recovery Dry sanitation systems eg. vacuum toilets | <ul style="list-style-type: none"> Decentralised desalination for coastal communities |

TECHNOLOGY OPPORTUNITY AREAS



How might we understand and support the diverse needs of our customers?

Number of interested utilities

| | Almost All | Many | Some |
|-----------------------------|---|--|--|
| Core Innovation | <ul style="list-style-type: none"> Customer platforms for one-way communication (sharing open data) New ways of engaging with customers | <ul style="list-style-type: none"> Smart meters Indicate real time water usage | <ul style="list-style-type: none"> Predictive modelling tools and digital twins |
| Adjacent Innovation | <ul style="list-style-type: none"> Customer platforms with flexibility for customers to provide feedback and information | <ul style="list-style-type: none"> Water efficiency devices linked to billing, operational needs, gamification AI analytics to better understand water use | <ul style="list-style-type: none"> Integrate energy and water data |
| Transformational Innovation | <ul style="list-style-type: none"> Customer platforms for two-way communication (sharing data eg. Blockchain) | <ul style="list-style-type: none"> Customer platforms for two-way communication (sharing data) plus a third party eg. electricity/rates/Amazon | <ul style="list-style-type: none"> Non-intrusive technologies that do not require meter replacement |

TECHNOLOGY OPPORTUNITY AREAS



How might we collaborate across sectors and share data which can be used by us, our partners, and communities?

Number of interested utilities

| | Almost All | Many | Some |
|-----------------------------|--|--|--|
| Core Innovation | <ul style="list-style-type: none"> Cross-organisation/ industry platforms (sharing small/sliced info) Smart sensors (plug and play) | <ul style="list-style-type: none"> Collect and share customer behaviour information across industry | <ul style="list-style-type: none"> "Voice of customer" technology |
| Adjacent Innovation | <ul style="list-style-type: none"> Cross-organisation/ industry platforms (flexibility to share sliced info) Smart sensors (integrates into other data sets) | <ul style="list-style-type: none"> Water efficiency devices linked to all parts of the business Water efficiency devices link to other organisations | <ul style="list-style-type: none"> Gamification across industries |
| Transformational Innovation | <ul style="list-style-type: none"> Open collaboration and communication with trusted partners | <ul style="list-style-type: none"> Integrated data acquisition for analysis for community and customer benefit (smart sensors) | <ul style="list-style-type: none"> Customer segmentation to improve engagement, water conservation and campaign participation |



**A confident and
secure water industry
empowered by
technology and
innovation.**

