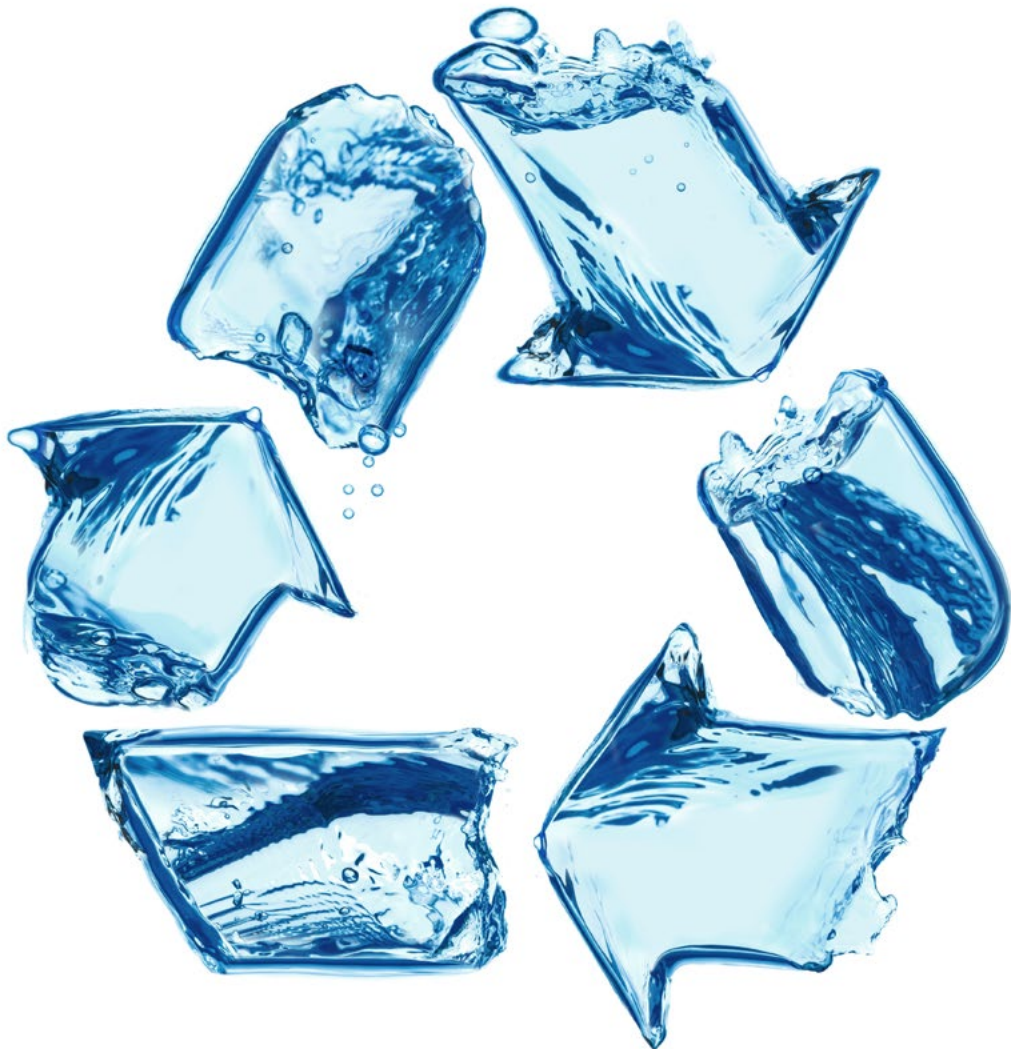


NO OPPORTUNITY WASTED

Cultivating circular ecosystems and championing
water industry innovation



WHAT WE HAVE DONE

Icon Water – the ACT’s water and sewerage utility – is implementing an innovative resource recovery program called ‘No opportunity wasted’.

Through this program we have reinvented our processes to generate resources, not waste. Cultivating local circular ecosystems and spearheading new opportunities for the water industry nationally.

Proudly winning both the Large Business and coveted Gold Banksia Sustainability Award 2020.

Utilities face many inherent sustainability challenges. For Icon Water, ours centre on the fact that:

- We supply the region with 24/7 essential water and sewerage services via more than 6,000 km of underground pipes and eight treatment plants
- We operate Australia’s largest inland sewage treatment plant which alone processes more organic wastes than ACT residential kerbside green waste collections
- We provide the region with more than 130 million litres of treated water every day.

In doing this, we were generating thousands of tonnes of wastes each year including sludges, soils, biosolids, treated discharge and office waste.

But, at Icon Water we aspire to be sustainability leaders.

Through ‘No opportunity wasted’ we are setting a new benchmark for water utilities to operate as resource recovery enterprises. This transformation is happening via eight initiatives outlined in Table 1 (page 4) and in Results (page 9).

This program didn’t happen by accident; sustainability is at the heart of what we do at Icon Water. In fact, our three sustainability principles directly allow us to achieve our core purpose – to ‘sustain and enhance quality of life’.

Our Sustainability Principles



ENRICH OUR NEIGHBOURHOOD

- Improve the liveability of the region
- Maintain the health of our people, our customers and the environment
- Engage with the community to deliver the best outcomes.



RESPECT RESOURCES

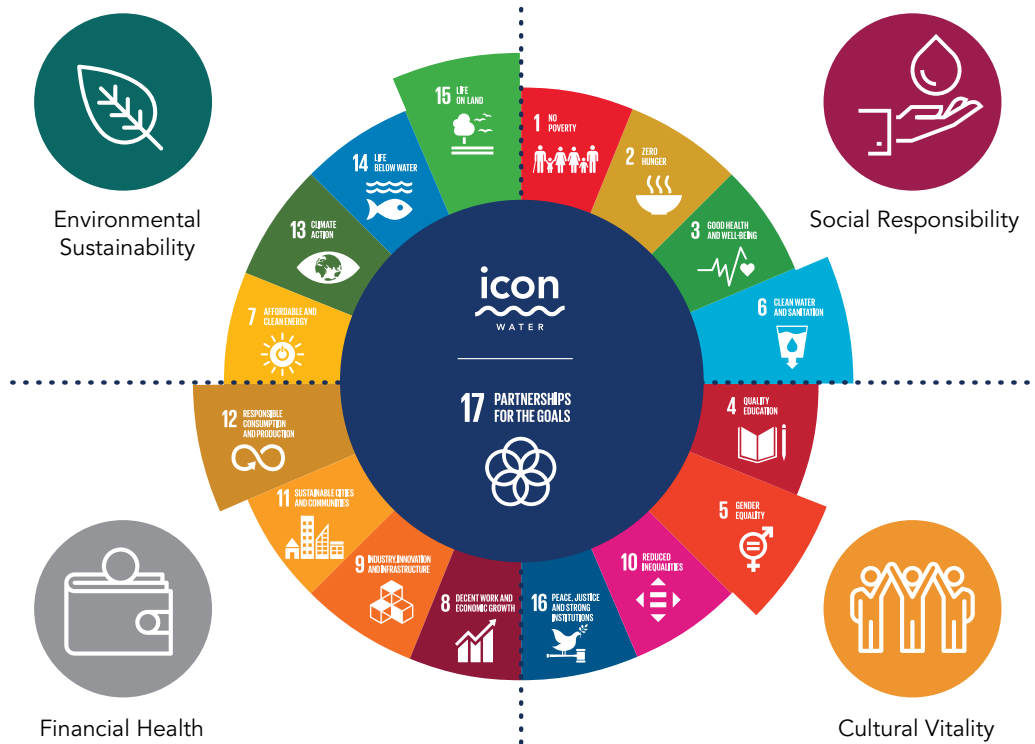
- Manage our financial resources and assets efficiently
- Foster a safe work culture that engages and develops our people
- Preserve our environment and only use what we need.



CARE FOR TOMORROW

- Consider the needs of our business, now and into the future
- Enable our business to evolve in a changing world
- Consider future generations in all that we do.

Additionally, we actively contribute to the 17 United Nations Sustainability Development Goals (SDGs) with a priority focus on SDG 12 Responsible Consumption and Production.



This focus is the cornerstone of our five-year *Waste Management and Resource Recovery Strategy 2017-23*, which sets out our targets, approach and vision to be a ‘utility that transforms waste into resources’ to maximise upcycling and minimise disposal to landfill.

Waste Management and Resource Recovery Strategy 2017-23

Vision

A utility that transforms ‘waste’ into resources

Objective

Deliver **best practice** waste management that **increases resource recovery**, reduces waste to landfill and supports a **local circular economy**.

Targets

- Increase proportion of purchased products made from recycled or repurposed materials
- Achieve a sustained reduction in operational waste to landfill from 2017-18 levels
- Track 90% of all solid waste managed by Icon Water using digital platform
- 75% of clean excavated natural material from network maintenance internally reused, 0% sent for disposal*
- Provide waste performance dashboards for Icon Water sites on a quarterly basis


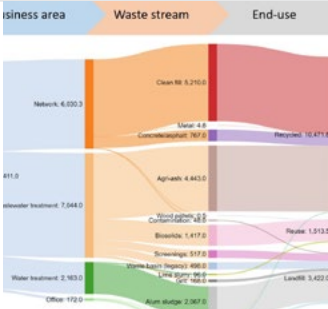


Approach





- 1. Measure, manage and avoid** – monitor and improve performance to be resource efficient
- 2. Maximise value of our embodied resources** – rethink approaches, realise opportunities and replicate strategies that optimise material reuse
- 3. Purchase upcycled and recycled** – buy less, demand greener products and choose wisely to grow a local circular lifecycle ecosystem
- 4. Empower, inspire and influence** – think global; act local, share successes and be locally attuned and responsive in cultivating cooperative relationships

*Assuming appropriate infrastructure and space maintained at Fyshwick STP or similar location

3

Table 1: 'No opportunity wasted' resource recovery program

What we've done	Sustainability achievement	Partners	
<p>INDUSTRY FIRST</p> <p>Plans have been produced for all eight treatment plants. More on page 6</p>	<p>INITIATIVE 1: Waste management plans</p> <ul style="list-style-type: none"> We understand our waste volumes We have identified opportunities to reduce waste to landfill We have optimised beneficial reuse options. 	Internal business units	
<p>BEST PRACTICE</p> <p>All waste data is entered into a digital platform. More on page 6</p>	<p>INITIATIVE 2: Waste monitoring system</p> <ul style="list-style-type: none"> Our waste practices are centralised, accessible and transparent We've been able to act on adaptive management opportunities. 	Envizi	
<p>AUSTRALIAN LEADING</p> <p>Agri-Ash from our sewage treatment process is used by local farmers as a soil enhancer. More on page 10</p>	<p>INITIATIVE 3: Agri-Ash</p> <ul style="list-style-type: none"> We keep 16 tonnes of Agri-Ash out of landfill every day We provide a local solution to nearby farmers to meet their fertiliser needs. 	Fertspread	
<p>INDUSTRY LEADING</p> <p>We collaboratively developed processes and infrastructure that allow us to reuse previously un-reusable soil and slurry. More on page 11</p>	<p>INITIATIVE 4: Spoil reuse</p> <ul style="list-style-type: none"> We have kept over 5,000 tonnes of material out of landfill (2019-20) 100% of our spoil is now reused: 72% reused internally 28% reused as top cover for a nearby council landfill, which directly prevents extraction of virgin material for this purpose. 	Snowy Monaro Regional Council Yass Earth Movers, SESL	

What we've done	Sustainability achievement	Partners
<p>INDUSTRY LEADING</p> <p>We experimented with two ways to find a successful reuse solution for our water treatment solids.</p> <p>More on page 12</p>	<p>INITIATIVE 5: Water treatment solids reuse</p> <ul style="list-style-type: none"> We are able to compost solids from the water treatment process with kerbside green waste to produce valuable landscaping materials with superior water holding capacity We also developed a process in which the solids are turned into mud bricks. 	<p>Corkhill Brothers, Mogo Mudbricks, SESL</p> 
<p>INDUSTRY LEADING</p> <p>We have developed a process to turn glass bottles, jars and containers back into their original state – sand.</p> <p>More on page 13</p>	<p>INITIATIVE 6: Recovered glass sand</p> <ul style="list-style-type: none"> ACT land developers have so far purchased more than 1,000 m³ of recovered glass sand This reduces virgin quarry and river sand extraction, creates a market for recycled product and keeps resources circulating – a sustainability win-win-win We expect greater uptake of the product with Icon Water likely to use 200 tonnes directly and land developers to use upward of 2,000 tonnes annually. 	<p>ReGroup, ACT NoWaste</p> 
<p>INDUSTRY FIRST</p> <p>We created biochar, a specialised potting mix for the horticultural industry, by combining biosolids at our sewage treatment plants with forest residue.</p> <p>More on page 14</p>	<p>INITIATIVE 7: Biochar</p> <ul style="list-style-type: none"> We have established a new potential option for sewage treatment – advanced thermal processing through biochar This could replace existing heat treatment systems when our furnaces approach the end of their service life over the next decade We are exploring options for collaboration with other utilities and presented our findings at the Global Water Research Alliance in November 2020. 	<p>Aecom, Yarralumla Nursery, researchers at CSIRO and Australian National University</p> 
<p>BEST PRACTICE</p> <p>Our ~400 staff can contribute to the ACT's container deposit scheme. We have also undertaken several other measurable resource recovery activities.</p> <p>More on page 15</p>	<p>INITIATIVE 8: Office initiatives</p> <ul style="list-style-type: none"> We've learned how to identify and act on a change in the recycling market We set up recycling hubs (made from recycling our wood crates) to collect bottles and cans from our staff We've so far recycled more than 3,500 items, raising funds for the charity Abundant Water. 	<p>Abundant Water, ACT NoWaste, Return-It</p> 



LEARNINGS

KEY LEARNINGS

- Gather data for fact-based decisions
- Take the lead and create a local ecosystem
- Communication and partnerships are key
- Build trust and confidence with regulators
- Where possible keep it simple
- Don't be afraid to fail and keep trying.

We bit off a lot in a short space of time as we commenced and completed most of the initiatives within the last two years. And throughout this journey there have been many lessons learned.

Benchmarking with our data monitoring initiative, we learned we were already recycling a large volume of our resources (almost 80% – see Figure 1). Understanding our waste streams was instrumental to the program's success as it allowed us to make strategic decisions about where our time and effort could make the most difference.

From there, we developed detailed waste management plans, which provide meticulous detail of the waste types and volumes we were generating, and at which stages in our treatment processes.

As far as we know, we were the first Australian water utility to undertake such an in-depth investigation. This innovation was recognised when we presented our findings at the 2018 Water Services Association of Australia (WSAA) Climate Change, Energy and Environment Network Conference in Adelaide.

Through our waste management plans we learned that several types of waste were being sent to landfill primarily because finding alternative solutions had been too complex. Reasons ranged from no industry precedent of alternatives to limited or no proven examples.

The next step was to prioritise real solutions for our largest sources of waste to landfill. This included growing our resource recovery capacity as well as finding higher-value reuse options for other wastes, in accordance with the waste hierarchy (Figure 2).

With this knowledge we took the lead in researching suitable solutions as well as forging trusting relationships with our regulators and establishing various regulatory approvals. We also built strong collaborative partnerships with local enterprises to create successful symbiotic relationships with shared objectives and outcomes.

Figure 1: Operational Waste and resources FY 2018-19

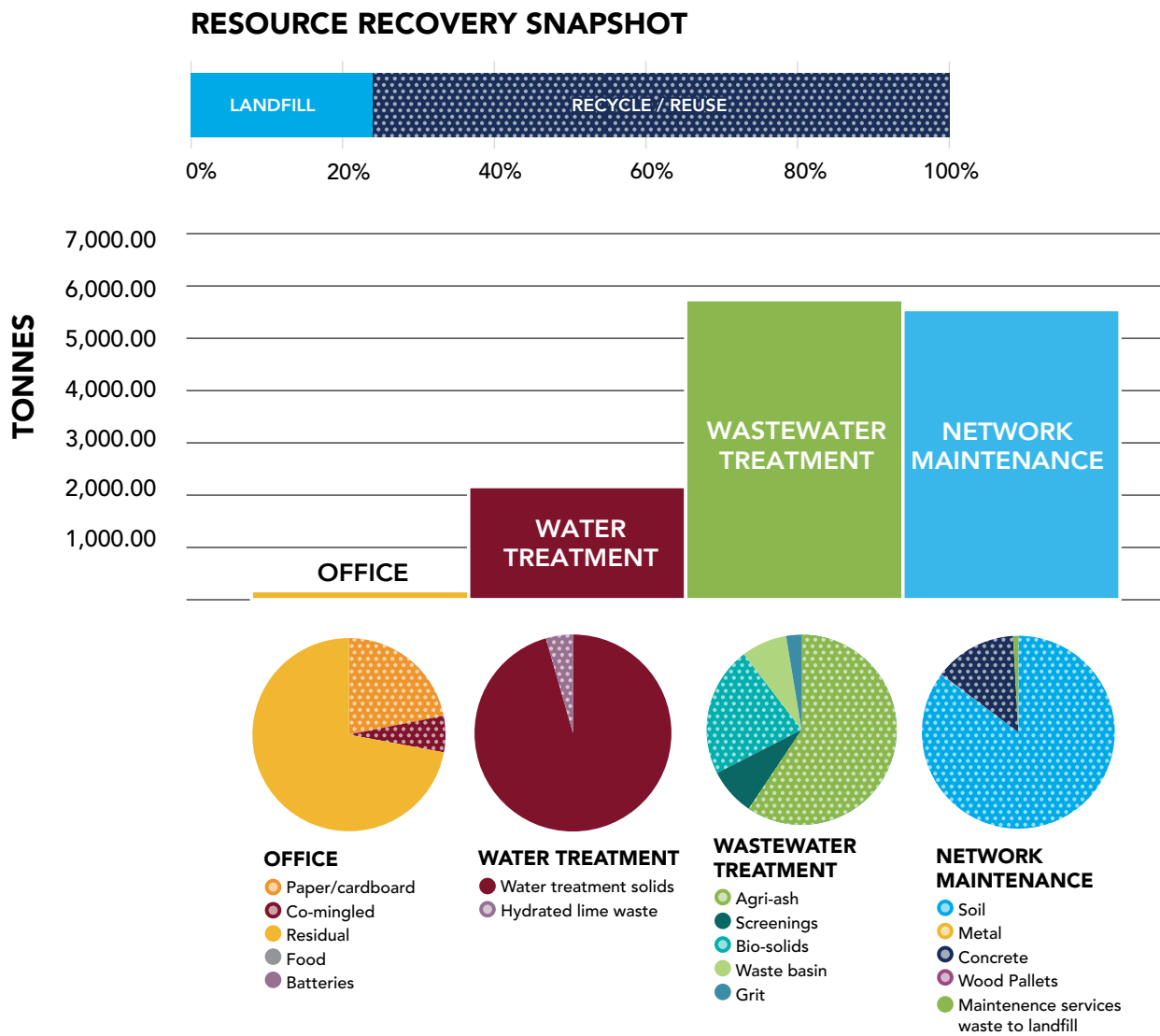


Figure 2: Waste hierarchy

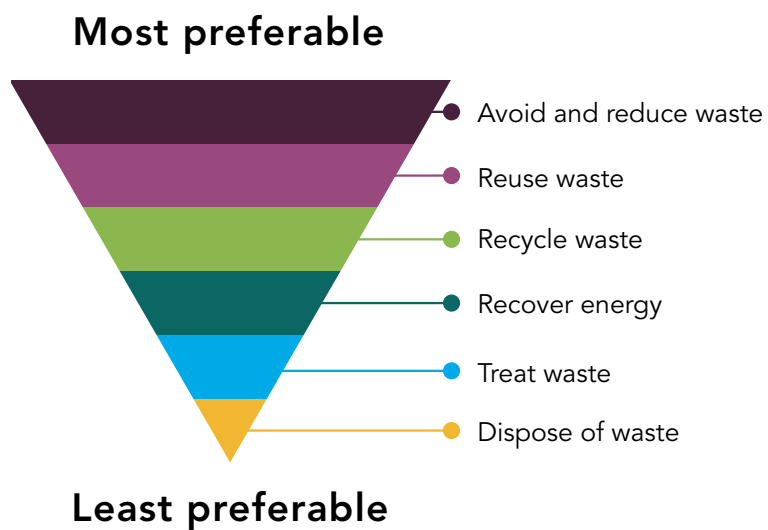


Table 2: ‘No opportunity wasted’ program key learnings

Challenge	Example and what we learned
<p>Some solutions were hard to find due to real or perceived material contaminants (such as our water treatment solids¹)</p>	<p>The solids material from the water treatment process has great potential to return nutrients and maintain moisture in soil. Despite this, over 2,200 tonnes generated annually were being sent to landfill, costing hundreds of thousands of dollars in tip fees and wasting valuable resources.</p> <p>It took significant time to research options, negotiate with the environmental regulator to allow the material off site for trials, investigate markets, build partnerships and undertake trials. Disposal of water treatment solids is a major problem for water utilities and our research papers were of interest and shared with the industry Australia-wide.</p> <p>We learned: Take the lead. Use data, science and quality communication to bring others with us.</p>
<p>Some solutions were not evident immediately</p>	<p>In seeking to reuse the solids left over from our water treatment plants, we undertook an early trial to manufacture mud bricks in collaboration with a local mud brick builder.</p> <p>The solution was successful, with the resulting mudbricks having the characteristics and strength required for building purposes (watch our video of the trial). Unfortunately, the demand was not present in the market for the volume of material we generate.</p> <p>We learned: Don’t be afraid to fail fast and keep trying.</p>
<p>Some materials were of a composition that was hard to reuse</p>	<p>Soil excavated from our water or sewer network is a wet slurry and isn’t structurally sound enough to be put immediately back into the excavated trench. This limits our ability to reuse it.</p> <p>Whereas other initiatives in this program sought to find new and creative uses for by-products, we weren’t able to find success there.</p> <p>What did work was to establish infrastructure that could dry and sort the material, thus transforming the slurry into a usable format that can now be repurposed as backfill for our excavations.</p> <p>We learned: Sometimes the solution is simple and lies in adjusting an unsuitable product to make it suitable for reuse.</p>
<p>Some solutions required transforming the market and workplace – as long as you’re ready to act on opportunities when they come up</p>	<p>We saw an opportunity with the introduction of Canberra’s container deposit scheme and the collapse in the international recycling market, to substitute extracted quarry or river sand material used in our works, with recovered glass sand. This involved initiating discussions and working closely with local producers (ACT NoWaste), potential suppliers (ReGroup) and our own engineers and maintenance crews to ensure support for a product that could be fit for purpose.</p> <p>This involved the installation of processing infrastructure at the ACT Government’s recycling facility, developing a unique product meeting strict engineering specifications (that can be used across the water industry), and gaining product approval by the regulators, before a six-month trial and ultimately launch of the product.</p> <p>We learned: We need to be ready to recognise opportunities when they arise. Just because something wasn’t possible before, doesn’t mean it won’t be possible now (or in the future!).</p>

.....

1. Water treatment solids are the left over soil solids and coagulant mix that remains after the treatment of drinking water.

RESULTS

'No opportunity wasted' continues Icon Water's commitment to the Sustainable Development Goals (SDGs), which we became an early supporter of in 2017.

Our [Sustainability Snapshot 2019](#) maps out our journey and demonstrates how we are supporting the goals. We have also published articles in the water industry [Sustainable Development Goals Progress Report: Global goals for local communities](#).

As Canberra's water utility, we recognise our significant role in realising SDG 6: clean water and sanitation. While 'No opportunity wasted' has a primary contribution to SDG 12, its impacts are wide reaching, contributing to several other SDGs as well.

The following case studies demonstrate the key results of each of the initiatives and also the SDGs they contribute to.

Figure 3: Program related SDGs



Program success and SDG alignment

Our proactive approach has achieved multiple environmental benefits and significant financial savings, aligning with our public [Sustainability and Environment Policy](#).

- Environmental benefits – using less material, decreasing transportation, keeping resources circulating at their highest utility, avoiding natural resource depletion
- Economic benefits – financial savings helping to keep water bills low, supporting viability of the local recycling industry
- Social benefits – avoiding the need for landfill and producing higher quality products for a more green and resilient city.



CASE STUDY Initiative 3 – Agri-Ash



2.4



9.4



11.6



12.2
12.5

Key result:

Our Agri-Ash processes keep 16 tonnes of Agri-Ash out of landfill every day.

How?

Canberra’s inland location means we treat sewage to a rigorously high standard, as our treatment plant discharges directly into the Murray-Darling Basin river system.

This process produces Agri-Ash – a product generated from the thermal treatment of sewage biosolids. Agri-Ash is then used as a soil conditioner by farmers in the local agricultural industry.

This reuse by local farmers keeps a colossal 16 tonnes per day of Agri-Ash out of landfill. The product is around 60% calcium-based and is especially useful to correct pH on regional pastures typically grazed by livestock. It is a safe and economical option for farmers and also saves us financially in tip fees. See our [video](#).

Our sophisticated solution is of particular interest to inland countries and communities.

In partnership with:

- Fertspreed**



CASE STUDY Initiative 4 – Spoil reuse



9.4



11.6



12.2
12.5

Key result:

5,000 tonnes of material reused in first year; increase from zero to 72% reuse internally in first year.

How?

When repairing and maintaining our underground water and sewer network, we often use water jetting and hydrovac operations so we don't disturb gas, electricity and other underground utilities.

This means the excavated material is often a wet slurry and not structurally sound enough to be put back into the trench. The best option we had was for it to be sent interstate as quarry backfill.

But we wanted to be able to reuse more of the spoil ourselves.

Working with regulators and field crew we developed processes and infrastructure to dry, test and sort the spoil, and then safely reuse it in other Icon Water excavations.

So far we've increased our internal re-use from zero to 72% which reduces the need to purchase topsoil. The remaining 28% is reused as top cover for a nearby council landfill, which prevents extraction of virgin material for this purpose. This initiative has led to over 5,000 tonnes of material being reused in its first year (2019-20), with significant savings on soil disposal costs.

This industry-leading solution was promoted across the water industry at OzWater 2020 conference via [podcast](#).

- In partnership with:
- **Snowy Monaro Regional Council**
 - **Yass Earth Movers**
 - **SESL**



CASE STUDY Initiative 5 – Water treatment solids reuse



Key result:

2,200 tonnes of material expected to be kept out of landfill each year; with remaining operational waste to landfill reduced by >60%.

How?

In this initiative we undertook a composting trial, mixing water treatment solids with kerbside-collected municipal green waste at Corkhill Brothers Mugga Lane composting facility. The result was a composting product of a quality that can be commercially sold.

Once all approvals are secured, and the product is marketed, this innovative solution is expected to keep 2,200 tonnes out of landfill each year, reduce Icon Water’s remaining waste to landfill by more than 60% and develop a saleable compost product for use by the community.

We are taking the trial one step further by adding supplements as required to realise a superior product meeting *Australian Standard AS 4454* – the best practice for the generation of soil conditioners, mulches and compost.

We have promoted this initiative across our business and community via our [video](#).

In partnership with:

- **Corkhill Bros**
- **SESL**



CASE STUDY Initiative 6 – Recovered glass sand



8.4



9.4
9.B



11.6



12.2
12.5



17.17

Key result:

Virgin material extraction by ACT land developers reduced by up to 2,000 tonnes due to Icon Water’s recycled material substitute.

How?

We use a lot of sand at Icon Water; most of our 3,000+ kilometres of sewer pipes are embedded in it.

The approval and launch of this cutting-edge solution using recovered glass sand for pipe embedment has led to the immediate purchase of over 1,000 m³ of recycled material by ACT land developers. This achievement helps reduce virgin material extraction and keep resources circulating in the economy, whilst creating local jobs and providing a cost competitive fit-for-purpose recycled product. Greater uptake of the product is expected with Icon Water likely to use 200 tonnes directly and contractors to use upward of 2,000 tonnes annually. We believe actively purchasing recycled products is just as important as upcycling our own products.

The launch of the product on 4 August 2020 by Icon Water Managing Director and ACT Minister Chris Steel gathered substantial media attention and recognition. See the [media video](#) and [news article](#).

In partnership with:

- **ReGroup**
- **ACT NoWaste**



CASE STUDY Initiative 7 – Biochar



9.4
9.5



11.6



12.2
12.5



13.3



17.17

Key result:

A truly future-focussed initiative that establishes the viability of advanced thermal processing through biochar as a potential replacement for existing furnace treatment systems at Icon Water’s sewage treatment plant.

How?

Together with our research partners, we explored the benefits of creating biochar from stockpiled sewage sludge and hardwood wastes to see if we could manufacture a high value commercial potting mix (see [video](#)).

We produced biochar via pyrolysis, which we used in a pot-plant trial to improve the soil condition for native plants at Yarralumla Nursery plus sequester carbon dioxide.

This state-of-the-art initiative was promoted at the National Biosolids Conference 2019 in Brisbane.

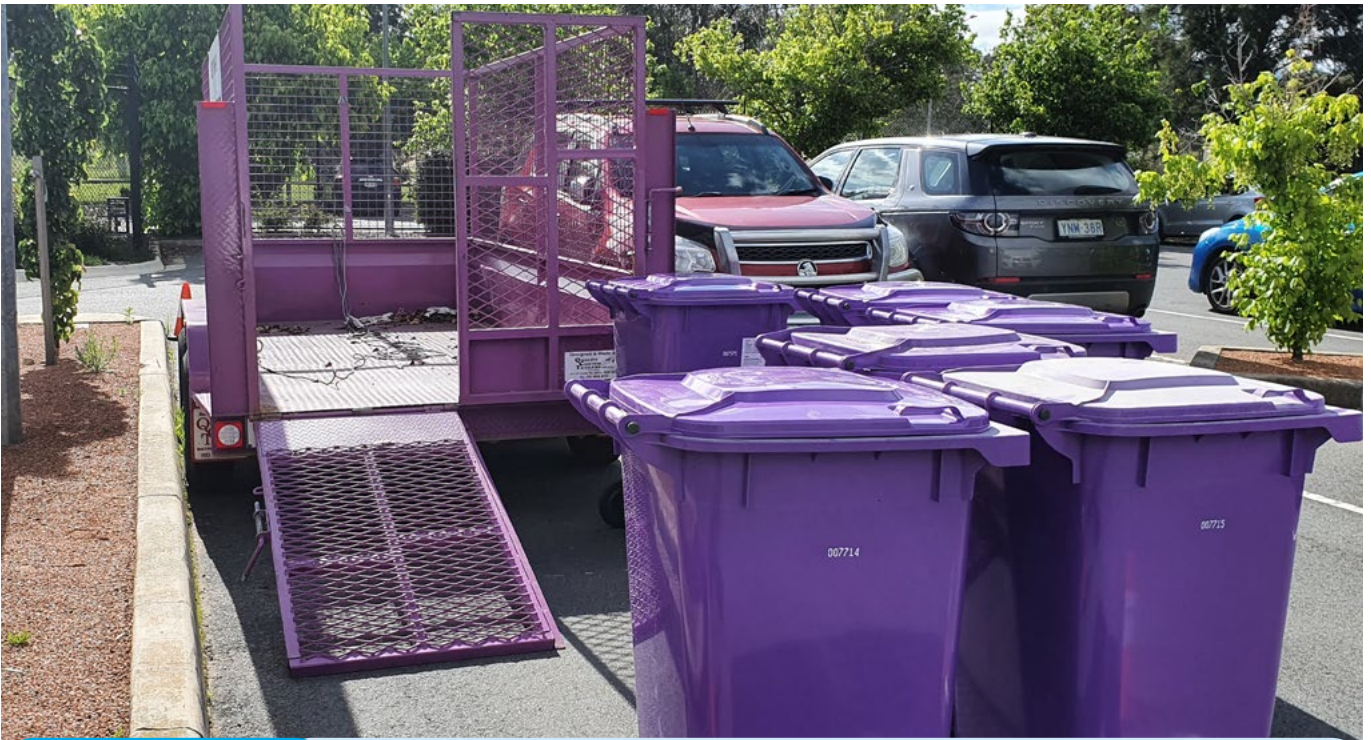
We analysed the plants (see [video](#)) and found that although traditional expensive potting mix could be

successfully substituted with 5% and 10% sewage sludge and wood biochar, we needed larger sample sizes for results to be conclusive.

We are exploring options with NSW based water utilities to potentially co-trial and create a world-leading biochar technology. To this end, we were approached to present on the biochar trial at the Global Water Research Alliance in November 2020.

We are also exploring the possibility of this innovation replacing existing heat treatment systems when our furnaces approach the end of their service life over the next decade.

- In partnership with:
- **Aecom**
 - **Yarralumla Nursery**
 - **CSIRO**
 - **Australian National University**



CASE STUDY Initiative 8 – Office waste initiatives



1.5



3.3
3.9



6.1
6.A
6.B



11.6



12.2
12.5



17.17

During the last two years, we have been involved with several small but still important activities:

We recycled over 13 tonnes of valuable metals from [our old water meters](#).

We've established recycling hubs in our offices where staff deposit batteries as well as more than 3,500 bottles and cans. These items attract a 10 cent refund via the container deposit scheme which is donated to the charity Abundant Water.

We conduct [office waste audits](#) to analyse waste from our office sites to determine if materials are in the right bin and where we can do better.

- In partnership with:
- **Abundant Water**
 - **ACT NoWaste**
 - **Return-It**

LEGACY

The legacy of the 'No opportunity wasted' program is twofold:

1

As a sustainability leader in our local community, we have been instrumental in bringing together businesses, organisations and government within the ACT and region.

We aim to lead the water industry to operate through a new lens – as resource recovery enterprises that transform 'waste' into resources.

The work to share our successes and learnings is already underway with presentations at conferences, articles in industry publications, and formal and informal industry collaboration arrangements in place.

We have taken stakeholders and the broader community on our journey through public media stories, blogs, videos, event presentations and stalls and direct engagement. While acting locally we have also influenced national policy as a contributor to the [national water industry paper on the circular economy](#) with our Manager Environment and Sustainability appointed as the inaugural Chair of the WSAA Circular Economy Community of Practice.

2

The innovations, infrastructure and processes we've developed, as well as the failures and lessons learned, are likely to be broadly or directly transferable to the water and wastewater industry Australia-wide and internationally.

We have consciously aligned our selection of opportunities with a symbiotic group of 'can do' partners. We fervently believe a circular economy cannot happen in isolation – for example, we collaborated with regulators and engineers on our spoil re-use initiative to develop new processes and infrastructure – the learnings from which can be broadly re-used in other industries.

We see this approach as a series of stepping stones towards the vision of developing a local eco-hub where all outputs are inputs for each other in a co-dependent, thriving and ultimately more resilient economy. Therefore, it is as much about us using upcycled or recycled products as it is about us generating upcycled, or recycled products to be used by others.

Enhancing resource recovery is a deliberate and dedicated initiative in our [business strategy](#) (page 25) to realise sustainable value, align with our priority SDGs and support our customers' and community's belief that any waste is too good to waste.

Undertaking collaborative open trials to see what is possible has led to successes implemented into ongoing operations, as well as some failures. We are committed to pursuing, and achieving, a more sustainable future.

We are now building on the success of this program and applying lessons learnt towards mitigation and adaptation to climate change to 'avoid the unmanageable and manage the unavoidable' with our commitment to net zero greenhouse gas emissions by 2045.

