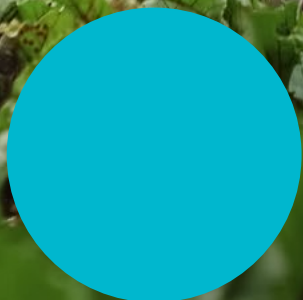


**Unlocking the
circular economy
in the Western
Parkland City**



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Acknowledgement of Country

Sydney Water and NSW Circular acknowledges the Traditional Custodians of the lands and waters that include the Western Parkland City. Their lore, traditions and customs nurtured and continue to nurture the waters within Sydney Water's operating area, ensuring wellbeing for all. We pay our respects to Elders, past and present, and acknowledge their continuing connection to land, water and community.

Foreword

The Western Parkland City is the largest greenfield development in NSW. As the city grows and evolves, the circular economy will play a vital role in ensuring that it becomes a resilient and sustainable city, and a place people where people want to live, work and visit.

Sydney Water's approach to the circular economy is key to achieving our goal of net zero environmental impact. We will realise this by delivering better outcomes through integrated water solutions that will restore and regenerate natural systems, keep resources in use at their highest value, and economically design out waste and pollution.

Sydney Water's Upper South Creek Advanced Water Recycling Centre will be located in the heart of the Western Parkland City and presents a unique opportunity to activate a broader circular economy ecosystem for the management of water, energy and resources.

The Centre will use industry-leading water and resource recycling technology and generate an estimated \$10 billion in social and economic benefits in Western Sydney through jobs and investment.¹

To maximise this opportunity, we want to understand the circular economy ambitions of our stakeholders, and how we might work together to create a better life with world-class water services.

It's my great pleasure to present this paper, which demonstrates a shared vision for the Western Parkland City. In this vision, natural, human and material resources are recycled and redistributed to maximise their value and minimise waste.

Excitingly, this vision is achievable if we work together to enable the recommendations set out in this paper. In doing so, we will create a national and global benchmark for a circular economy ecosystem on the largest scale seen to date in Australia.

NSW Circular is proud to partner with Sydney Water on this important work to activate the Circular Economy in the Western Parkland City.

Transitioning to a circular economy is essential in order to grow the jobs and industries of the future, drive productivity and protect our planet. In a resource-constrained, climate constrained-future, the circular economy is the only economic framework enabling growth while tackling the consumption and climate crises.

Keeping resources in the economy longer, designing out waste, and increasing sharing and reuse and new circular products and services will not only build a more resilient future, but will also cut carbon emissions. Almost half the carbon emissions needed to be cut to meet Paris targets are embedded in products and food - in the way we manage and dispose of them.

Circular economy is a \$1.9 trillion economic opportunity for Australia. This report reflects the significant opportunities for Western Sydney to lead the way in building the circular economy of the future and the wealth of benefits for those who seize the opportunity.

We commend Sydney Water for its leadership in bringing together industry, government, and research leaders to map out a clear transition pathway to build a more resilient, sustainable and circular Western Sydney.

Reducing waste is now a critical priority not just because we are running out of virgin resources, but because we are also losing the natural systems that regenerate our planet. This report presents a plan to regenerate those systems, improve resilience while building thousands of new jobs, new supply chains and industries in the Western Sydney Parkland City.



Roch Cheroux
Managing Director
Sydney Water



Lisa McLean
CEO
NSW Circular

¹ Sydney Water, Re-imagining water in Western Sydney – Western Sydney Regional Master Plan, 2019.

An opportunity to create a circular economy in the Western Parkland City

The Western Parkland City presents a rare opportunity to design a city that is not only comfortable and prosperous but is also sustainable.

Transitioning to a circular economy ecosystem through thoughtful land use planning and wider re-use of local water, materials and waste will be critical for unlocking sustainable economic growth. Sustained economic success is reliant on businesses that can offer climate, resource and supply chain resilience. It is also reliant on businesses that are focused on resource productivity. It is estimated that even a 5 per cent improvement in materials' efficiency would add \$10 billion to NSW's gross state product and increase real wages by 2.8 per cent.²

Sydney Water is committed to investing in new technologies and projects that will drive the local circular economy, along with reducing waste and increasing our ability to manage valuable resources.

This includes the Upper South Creek Advanced Water Recycling Centre in the heart of the Western Parkland City. The Centre, which will be operational by 2026, will act as a circular economy hub for water, energy, bioresources and skills in the city (Figure 1). When it reaches maximum capacity, it will treat up to 100 million litres of wastewater each day for a range of agricultural, residential and industrial uses.

To initiate a conversation about how to activate the local circular economy, Sydney Water teamed up with NSW Circular to host a Discovery Workshop for more than 60 partners and stakeholders. This was followed by a Leaders' Roundtable, which was designed to test and hone the strategic opportunities identified in the workshop.

The shared vision and recommendations formulated through this process are shared in this paper.

The circular economy is a real opportunity for us in the Western Parkland City – we have significant developments that will need a great number and diversity of jobs.

Joanna Kubota Executive Director, Western Parkland Councils

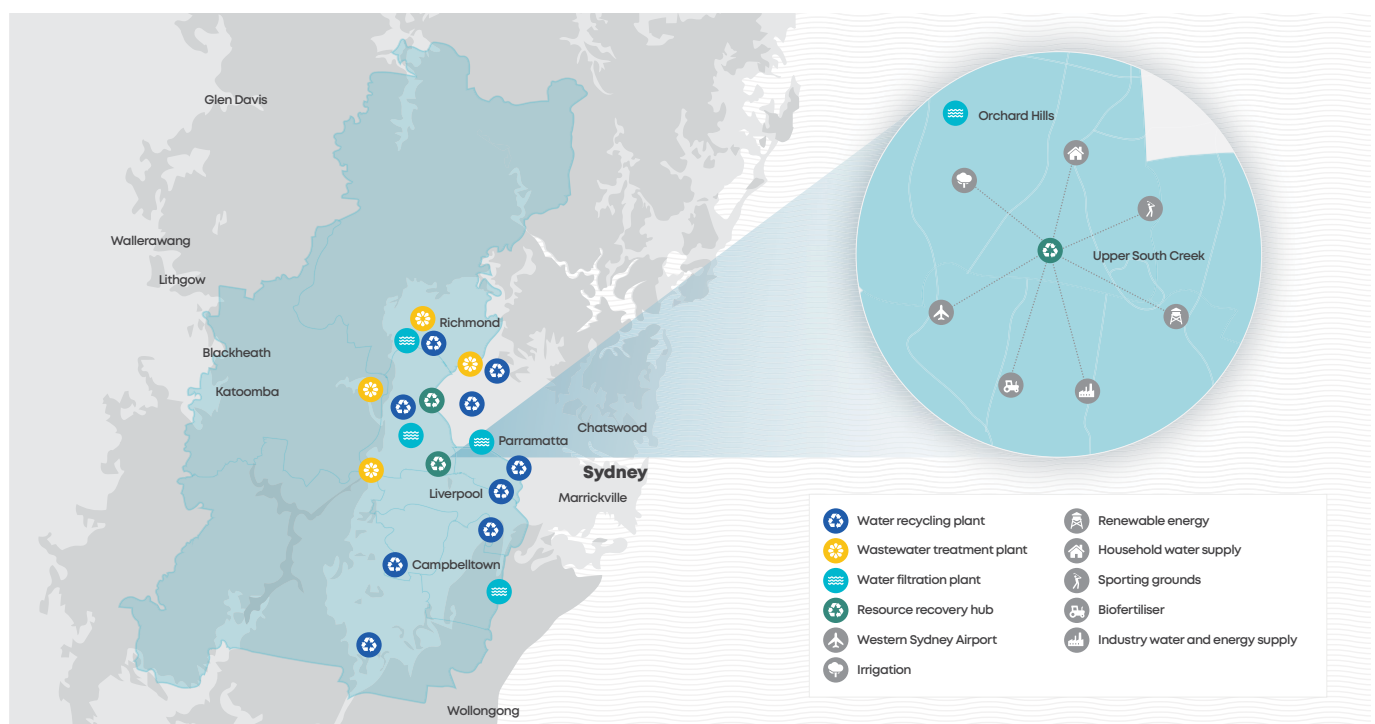


FIGURE 1: Upper South Creek Advanced Water Recycling Centre as a potential resource recovery hub for the Western Parkland City

² Centre for International Economics, headline economic value for waster and materials efficiency in Australia, 2017

A shared vision for a circular Western Parkland City

With the new Western Sydney International (Nancy-Bird Walton) Airport, and surrounding Aerotropolis at its heart, the Western Parkland City will offer vibrant commercial hubs, industry precincts, world-class educational facilities, plentiful jobs, and diverse and affordable housing. Its population is forecast to nearly double to more than 1.7 million people by 2036.

Our stakeholders vision for a circular city will create a 22nd century city that is green, resilient and prosperous.

Vision for a circular Western Parkland City



Supply chain integration

A society that makes the most out of the resources it consumes. The city has integrated infrastructure and circular supply chains that optimise material, water and energy use in all parts of the city. Renewable energy will be the predominant source of power, including the production of renewable gas from local organic waste.



Smart

The city will be home to the new Western Sydney International (Nancy-Bird Walton) Airport, an advanced manufacturing sector, world-class research sector, and a thriving social and cultural ecosystem. The economic opportunities unlocked by the city will make it home to some of the best minds and skills in the world.



Sustainable

This economy will be built with a low-carbon, low-emissions footprint. It will be planned with climate resilience and liveability in mind, including protecting and regenerating natural systems, supported by renewable cooling and greening, in the city and its surrounding region.



Shared benefits

The benefits of the circular economy will be equitably shared by all, through a cool, green, resilient and prospering city.



Unlocking opportunity for the circular city

To realise this vision for a circular Western Parkland City, government, industry, research organisations and community groups must act now. Six key actions will help activate the local circular economy.

1. Set targets and policies that help create a circular city

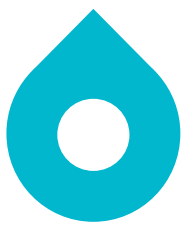
Strong alignment and coordination between government agencies, the private sector and local communities is needed. This includes data sharing, accountability and shared prioritisation of circular economy outcomes.

This can be achieved by developing and publishing the circular economy vision, targets and key success indicators for the Western Parkland City. These should be set and shared by state and local governments, in collaboration with stakeholders in the city's future, such as local business, researchers, community groups and residents.

To meet these shared targets, we also recommend:

- embedding the targets in state and local governments' policy objectives and operational activities, to ensure alignment between different levels of government on their respective responsibilities and accountability for policy, planning, delivery, funding and progress reporting within each agency's sphere of control
- developing clear implementation plans and guidance for achieving the targets
- supporting these targets with public commitments by non-government stakeholders
- incorporating these targets into business cases for new infrastructure in the city
- establishing a one-stop-shop to drive the delivery of this vision by identifying and connecting opportunities for collaboration and circular economy investment (see Recommendation 3).





2. Value circular economy outcomes in business cases for infrastructure investment

The Western Parkland City has the potential to be an exemplar for new urban systems that integrate resource management infrastructure for more efficient and effective outcomes. However, an integrated approach to infrastructure development needs a new approach to valuing the benefits of new infrastructure investment.

Infrastructure sponsors and investors from the public and private sectors, for example, can drive the shift towards integrated infrastructure by including performance-based circular economy targets and objectives in their investment criteria and design briefs.

To guide investment, decision-makers can require specific indicators in business cases, such as valuing the benefits of:

- integrated infrastructure
- the social, environmental and economic impacts over the lifespan of the investment
- cost savings and new revenue streams from co-location with compatible industries and integration with other networks.

The NSW Government can also provide leadership in how it scopes and delivers its capital projects. This includes providing targeted guidance through the government's Business Case Guidelines and Procurement Framework for agencies and state-owned corporations on how to develop circular economy performance requirements and outcomes.

This guidance can then also be used by local government agencies and referenced by investors and developers when developing business cases for new infrastructure and other investment decisions.

3. Centralise information with a one-stop-shop for circular economy resources

The ability to access regulatory information and public funding for circular economy innovation is critical to the successful integration of circular technologies into city architecture and infrastructure.

However, having to deal with multiple regulatory bodies and organisational systems can make it difficult for stakeholders to quickly access the information and approvals they need to get projects up and running.

To help cut red tape and remove current barriers to innovation, we suggest creating a central point of access for the information, government support and partners needed to bridge information gaps and drive circular solutions in the Western Parkland City.



The Western Parkland City can be a showcase for how cities are built.

Melissa Doueih

Manager, Western Sydney Development,
Endeavour Energy



4. Create systems and incentives to connect circular supply chains

With a significant rise in industrial activity expected as the Western Parkland City develops, creating the right conditions to grow circular supply chains quickly and at scale is critical. We recommend the following:

Supply chain–matching solutions should be developed at scale to enable the ecosystem to grow. This includes matching not just production material needs, but also opportunities for shared use of infrastructure, logistics and other resources.

Stakeholders see significant value in a central business-to-business platform that can drive cost-effective aggregation of circular supply chains at scale, including the ability to:

- connect outputs with production inputs
- connect buyers with suppliers of sustainable products
- facilitate aggregation of demand or supply flows to create improved commercial outcomes
- collect data on the demand and supply of resources.

Promote small and medium sized enterprise (SME) participation in circular supply chains. SMEs often find it difficult to find opportunities to participate in circular supply chains. A separate process may be required to engage with SMEs to identify and overcome barriers faced when participating in the circular economy, including those looking to access government funding and programs.

Incentivise circular partnerships and co-location.

Several measures should be considered by the NSW Government to strengthen the case for businesses to invest in circular partnerships and co-location in the Western Parkland City. These include:

- streamlining planning and regulatory processes for integrated utilities and transport infrastructure to incentivise their development and reduce the cost of site establishment, utilities and logistics
- identifying circular supply chain partners and communicate the best co-location opportunities through comprehensive analyses of materials being generated and disposed through the region, infrastructure needs, by-product use and transport paths to end users
- incentivising the local production of renewable gas using local organic waste and wastewater to offset industrial energy costs and carbon emissions
- providing additional government incentives for co-locating industries that can create new value chains through the re-use of waste and by-products for productive re-use within the city.

Transforming household and industrial organic waste into renewable energy

Billund BioRefinery in Denmark is a wastewater treatment plant that receives local urban wastewater, separated organic household waste and industrial organic waste. These are then fed into an anaerobic digestion process to produce renewable energy, heating and organic fertiliser.

In the future, the plant may seek to use its inputs to create hydrogen and methane fuel cells, which create less waste by-products – demonstrating what might be possible for Sydney Water's Advanced Water Recycling Centre.



5. Optimise water cycle management for a green, cool and climate-resilient city

The projected growth in population and industrial activity in the Western Parkland City means the availability of water is more important than ever before. An estimated additional 47 GL of water per year on average will be required.³

New investment in water infrastructure is critical to meeting the city's projected water needs. Importantly, one of the goals of these investments should be accelerating the uptake of recycled water.

Citywide access to recycled water and capturing and reusing stormwater will reduce reliance on drinking water for non-drinking purposes. This can also address urban heat island effects and thermal inequality by nourishing more public green spaces and urban tree canopies, creating attractive locations for local communities.

Recycled water can also be utilised by industrial, commercial, educational and hospital settings for water-based cooling systems, such as cooling towers and district cooling systems. Within the Western Parkland City, recycled water can be delivered from the Advanced Water Recycling Centre or through on-premises water recycling facilities to chill recycled water for cooling buildings.

Smart water planning and management at a regional level brings together all parts of the water cycle. It also allows for the integration of recycled water with stormwater retained in existing waterways to create cool vegetated corridors, improve waterway health and contribute to public open space.



Trialling modular greywater recycling in Western Sydney

A pilot is currently underway in the Western Parkland City to test Hydraloop – a new on-site household greywater treatment technology that aims to reduce drinking water use while making more water available for irrigation. The technology treats wastewater from baths and showers, which is then used for toilets and gardens.

It is anticipated that households with Hydraloop units could reduce their water use by 25 to 45 per cent – the equivalent of around \$180 a year on water bills.

The pilot is also testing the concept of subsidising household greywater treatment, in exchange for irrigating 'adopted' local public land trees from the host household greywater system.



6. Aggregate local organic waste collection for energy recovery

Globally, biofuel production is projected to increase tenfold by 2060. It's an important part of decarbonisation strategies worldwide.

For Australia to contribute its share of that output, an annual production capacity of 20 gigajoules is needed. This is a 40-fold expansion of the domestic biofuels industry. If this expansion is realised, the industry could potentially help avoid up to 9 million tonnes of CO₂ emissions and create an estimated 250,000 long-term jobs.⁴

Water treatment plants are a potentially significant source of renewable gas (biomethane and hydrogen) and can help the transition from natural gas sourced from fossil fuels to renewable gas.

The Upper South Creek Advanced Water Recycling Centre can support a large-scale bioresources hub that can offer integrated circular water, energy and organic waste management at a precinct level.

However, this requires sufficient volumes of organic waste for the hub to be commercially feasible. This can be achieved by aggregating food and beverage waste, as well as source separated organics from businesses, farms and households in surrounding areas.

The energy and products derived from the digestion process can then be supplied to local households, urban amenities, industries and farms – thereby extending the value chain for this waste. The hub can also trial new technologies such as green hydrogen solutions.

Partnering on the Malabar Biomethane Project

Anaerobic digestors at wastewater treatment facilities can produce raw biogas – typically a mix of methane and CO₂ – from organic waste.

In 2021, Sydney Water partnered with Jemena and the Australian Renewable Energy Agency to develop Australia's first biomethane gas-to-grid project using the Malabar Wastewater Treatment Plant in south Sydney.

The facility is being expanded to include a biogas upgrader system to remove non-methane gases from the biogas to produce biomethane that meets the Australian Standard A4564:2020 gas specification. This can then be injected into the gas grid.

When it commences operation in late 2022, the project will generate 95,000 gigajoules of biomethane each year – enough to meet the gas demand of over 6,000 homes and reduce emissions by more than 5,000 tonnes.

Using wastewater sludge to create gas helps limit waste by-products and creates a new source of renewable energy that reduces costs and negative environmental impacts.

The plant will also be the first participant in a pilot for a new certification for renewable gas, which will help gas network customers directly support renewable gas projects in Australia.



An opportunity already exists to divert waste from landfill to generate biogas.

Cameron Bush

Chief Operating Officer, Bush's Proteins



⁴ CEFC and ARENA, Biofuels and Transport: An Australian opportunity, 2019.

Creating a shared future together

If government, business, research institutions and community groups act on these recommendations, realising the vision of a circular Western Parkland City is not just a possibility, but well within reach.

However, we also understand that a shared vision of a circular city requires a shared understanding of what it entails, and of its wider social, environmental and economic benefits. That's why we believe it's important to expand this discussion to not only include our stakeholders but also the people who will live and work in the Western Parkland City.

Ultimately, we hope to demonstrate what can be achieved through thoughtful planning and design as the Western Parkland City develops, and to see the city become a model for others to aspire to in the future – in Australia and around the world.

Thank you to all our partners, stakeholders and roundtable leaders, who made this report possible. We appreciate your passion for the circular economy and generously sharing your ideas.

Agrology

Anaergia

Beak and Johnston

Bingo

Bush's Proteins

Camden Council

Cleanaway

Coles

CSIRO

Department of Planning, Industry and Environment NSW

DHL

Diageo

Downer Group

Endeavour Energy

Environment Protection Agency NSW

Fairfield City Council

Global Express

Greater Sydney Commission

Hawkesbury City Council

Industry Capability Network

IQ Energy

Jemena

Liverpool City Council

Local Government NSW

Maxton Fox

Mineral Carbonation

Mitsubishi Heavy Industries

Origin Energy

Penrith City Council

Phantm

PV Industries

Smart Cities Development

Snack Brands

Suez

Transport for NSW

University of New South Wales

University of Sydney

University of Technology Sydney, Design Innovation Research Centre

University of Technology Sydney, Institute of Sustainable Futures

Veolia

Western Parkland City Authority

Western Parkland Councils

Western Sydney Airport

Western Sydney Regional Organisation of Councils

Western Sydney University

Wollondilly Shire Council



For further information or to discuss partnership and investment opportunities, please contact StakeholderEngagement@sydneywater.com.au.

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