Sydney WATER

Annual Environmental Performance Report

2021-2022

Incorporating our Special Objectives Statement

Acknowledgement of Country

Sydney Water respectfully acknowledges the Traditional Custodians across Dharawal, Gundungurra, Darkinjung, Dharug and Eora nations where we work, live and learn. Their lore, traditions and customs nurtured and continue to nurture the waters, both saltwater and sweetwater, in our operating area, creating wellbeing for all.

We pay our deepest respect to Elders, past and present. We acknowledge their deep connections to the land and waters. We are committed to reconciliation and partnering with our Traditional Custodians, to ensure ongoing collaboration on Caring for Country now and into the future, learning from traditional and contemporary approaches, while maintaining and respecting cultural and spiritual connections.

Our families, friends and future generations depend on us to protect our water resources and our environment. In doing so, we respect the traditional 'Caring for Country' restorative approaches practiced over tens of thousands of years by our First Nations people and play our part to sustain and improve the health of the landscape by recognising and nurturing the value of water in our environment and communities.

Artwork by Dennis Golding inspired by a topographic patterning of Sydney and connects stories of both saltwater and freshwater people, land sustainability and culture.

Contents

01 Executive summary

Sydney Water has prepared this Annual Environmental Performance Report 2022 which incorporates our statement on the implementation of our special objectives, as required by the *Sydney Water Act 1994* (the Act), and our Environmental Indicators Performance Report 2021-22. (Appendix A).

This report summarises how we have addressed the special objectives identified in Section 22 (6) of the Act between 1 July 2021 and 30 June 2022 and provides a holistic statement focused on wastewater discharges and trending data. In addition to this report, Sydney Water publishes comprehensive performance reports on our website that demonstrate our implementation of, and performance against, the special objectives.

Sydney Water integrates environmental and public health management into its business decision-making and operational activities. The special objectives are implemented within the business holistically, rather than as separate considerations.

This approach ensures social, economic, public health and environmental considerations are balanced and part of Sydney Water's business as usual operations. We have several management systems, plans and frameworks to support and address the special objectives.

Table E-1 highlights key points from the report which demonstrate positive, negative or stable trends/outcomes. Overall, the trend is positive, and we are committed to continually improve our environmental performance through our management system frameworks and improvement programs. The report also provides details on key initiatives to improve our performance, most notably in our wastewater systems. These are summarised in Table E-2 against the related environmental issue.

TABLE E-1 AN OVERVIEW OF ENVIRONMENTAL ISSUES AND TRENDS/OUTCOMES

TREND/ OUTCOME LEGEND: NO CHANGE INCREASE DECREASE
IMPROVING/MEETING TARGET NEEDS IMPROVEMENT / NOT MEETING TARGET NO TARGET

***Sydney Water Act 1994* means**	**Environmental Issue/ Indicator**	**Key measures from 2021-22 report**	**Trend/ Outcome**
Reduce impact of discharges to the environment	Environmental Performance Indicators	Environmental Impact Index	
		Ecological footprint	
		Net Zero Emissions – Carbon Footprint (Scope1,2 and 3)	
	Wastewater treatment discharges	Maintain waterway flow	
		Total Nitrogen load (estimated) from inland plants	
		Total phosphorus load (estimated) from inland plants	
		Oil & grease discharged from our Deep Ocean Outfall facilities	
		Total suspended solids at our Deep Ocean Outfall facilities	
		Beachwatch sites impacted by wastewater overflows	
	Wastewater Network discharges	Maintain compliance with dry weather overflow limit condition	
		Total number of wastewater overflows reaching waterways	
		Total number of chokes	
		Frequency of wet weather overflows	
		Wet weather overflow volume	
	Stormwater network discharges	Silt and rubbish removal volume	

Efficient and sustainable resource use	Energy use	Grid electricity consumption	↑
		Renewable energy generation	↓
		Fuel usage	↑
		Gas consumption	↓
	Circular economy and resource recovery	Biosolids – beneficial reuse	→
		Solid waste generation	↑
		Construction and demolition waste recycling	↑
		Office waste recycled/reuse rate	↑
Community involvement	Water conservation	Demand on drinking water	↓
		Leakage	↓
	Community awareness programs	Wastewater campaigns and education programs	→
	Community monitor surveys	Community monitor survey results Q1, Q2, Q3, Q4	→

TABLE E-2 AN OVERVIEW OF ENVIRONMENTAL ISSUES AND TRENDS/OUTCOMES

Environmental Issue	Key points from 2021-22 report
Reduce impact of discharges to the environment	
Environmental Performance Indicators	We continue to monitor our Environmental Impact Index to track overall progress towards achieving 'thriving, liveable and sustainable cities'. The index score is trending positively towards our 2025 target at 148.7 in 2021-22, compared to 2020-21 (154.7) and 2019-20 (162.5). We recognise further improvements are required and we're committed to achieving our target.
	In 2021-22, Sydney Water's total ecological footprint from all sources (including direct, indirect, and Scope 1, 2 & 3 sources) was 114,000 ha (compared to 109,000 ha in 2020-21). Whilst Sydney Water's total carbon footprint from all sources (Scope 1, 2 & all Scope 3 sources) was 783,000 t CO2-e. There was a slight increase in emissions compared to 2020-21 (at 745,000 t CO2-e) mainly due to an increase in capital works projects. We have committed to a Net Zero Carbon plan that articulates our strategic direction to realise our ambition of being net zero in our operations by 2030 and in our supply chain by 2040. This will reduce the carbon emissions associated with major infrastructure projects by using products with greater recycled content (e.g. concrete) and working with our suppliers and delivery partners to reduce their emissions.
Wastewater treatment discharges	Oil and grease reduction continued in our treated wastewater discharge from Bondi Water Resource Recovery Facility (WRRF) and North Head WRRF. However, Malabar WRRF oil and grease showed an increasing trend, impacted by trade waste incidents possibly impacting the efficiency of the primary sedimentation process.
	The beach suitability grades for Beachwatch sites in 2021-22 deteriorated at four sites and were stable at 15 others, compared to the 2020-21 results (where two deteriorated, one improved and 13 were stable).

Environmental Issue	Key points from 2021-22 report
Wastewater treatment discharges (cont.)	**Key relevant initiatives** • In late 2021 Sydney Water launched a campaign called "It's Best to Bin it" to influence the behaviours of our business customers to manage their wastewater better and ultimately reduce the amount of fats, oils and grease entering our wastewater system. • Sydney Water partnered with Restaurant and Catering Australia (R&CA) to educate businesses in the retail food industry on the sustainable management of water and waste. • In 2021-22 Sydney Water conducted planning for the roll out of a trade waste compliance program targeting the retail food sector in the Bondi WRRF catchment in 2022-23. • Sydney Water is currently conducting programs of work to reduce overflows to Rose Bay Beach and Foreshore Beach. • We are exploring options to better monitor the upstream wastewater network using volatile organic carbon (VOC) monitors at pre-determined locations to provide an early warning detection system in the event of a trade waste incident. We are also continuing to collaborate with trade waste customers and the EPA. We are progressing several major projects that will improve wastewater treatment performance including upgrading West Camden WRRF and the Lower South Creek Treatment Program. • Aligning the basis of design and planning for the new Upper South Creek Advanced Water Recycling Centre project, Warriewood WRRF UV disinfection project, and Illawarra Regional planning to RCP 4.5 climate projections.
Wastewater network discharges	Wastewater volumes from dry weather overflows decreased in 2021-22, 15.4 ML compared to 22.5 ML in 2020-21. However, there was a volume increase of 30% from our inland wastewater catchments. Total number of wastewater overflows reaching waterways was 362 in 2021-22 (461 in 2020-2021). Twelve systems have Condition L7.4 System Limits specified in their EPLs. Among these, six were under or equal to their limits in 2021-22 while the remaining six systems exceeded their EPL limit (compared to seven in 2020-21). The number of uncontrolled dry weather overflows increased, 582 in 2021-22 compared to 433 in 2020-2021. Total number of chokes/network blockages experienced within our wastewater network continued to reduce in 2021-22 (11,070) compared to 2020-2021 (12,889). The frequency of wet weather overflows from seven wastewater systems exceeded the limits within their Environment Protection Licences (condition L7.2 i.e. maximum number of overflows per 10 years). Trends in wet weather overflow volume increased in 2021-22 for inland systems, due to above average rainfall in 2021-22. **Key relevant initiatives** • Preventive waterway program Level 1 (maintenance hole inspections) • IoT (Internet of Things) installations for overflow prevention • Lost flow analysis • Continuous lining • Artificial intelligence & detection in sewers
Stormwater network discharges	We removed silt and rubbish from over 75 stormwater quality improvement devices which prevented 1,659 m^3 of debris and 1,301 tonnes of sediment from entering Sydney's waterways in 2021-22 (compare to 1,052 m^3 and 1,288 tonnes in 2020-21). **Key relevant initiatives** • Ongoing works to naturalise and improve stormwater networks, and adoption of water-sensitive urban design principles.

Environmental Issue	Key points from 2021-22 report
Efficient and sustainable resource use	
Energy use	Sydney Water's goal is to achieve grid electricity consumption equivalent to 1998 levels (366 GWh). In 2021-22, consumption was 386 GWh, above the internal benchmark by 19 GWh (compared to 365 GWh in 2020-21).
	Sydney Water's on-site renewable energy generation (53 GWh) was equivalent to 12.2% of total energy consumption in 2021-22. Renewable generation was slightly lower than the previous two years.
	Fuel usage from Sydney Water increased due to the rolling back of COVID-19 restrictions and an increase in reactive work due to wet weather and floods.
	Gas consumption decreased in 2021-22 as consumption at our West Ryde Laboratories significantly reduced from September 2021 to April 2022. The gas hot water units at West Ryde were upgraded and now perform efficiently.
	Key relevant initiatives • Implementation of the Net Carbon Zero Plan from 2021-22 onwards.
Water conservation	Water leakage in 2021-22 was estimated at 121.5 ML/d, an increase compared with 2020-21 (112.5 ML/d) despite a continued focus on our leakage program. It is within the range of the Economic Level of Leakage (ELL) band of 108 ± 16ML/d. Analysis indicates it may be due to the ongoing wet weather with reduced ability to detect visible leaks.
	Water Conservation efforts lead to 12,700 ML of water savings.
	Key relevant initiatives • Ongoing implementation of Water efficiency programs • Minimise the loss of water through leakage reduction programs • Maximise recycled water production
Circular Economy and Resource Recovery	Sydney Water has been consistently achieving 100% beneficial use of biosolids.
	Sydney Water generated 355,973 tonnes of solid waste, an increase of 48% from 2020-21, mostly attributed to our construction and demolition activities.
	The overall recycling rate for 2021-22 was 80%, an increase from 61% in 2020-2021, due to a continuing increase in recyclable construction and demolition waste.
	This increase in recycling was shown in all three categories, with construction and demolition being the major contributor, and office and process waste showing a slight improvement.
	Key relevant initiatives • Released Sydney Water white paper with NSW Circular and other stakeholders, "Unlocking the Circular Economy in Western Sydney". • Completed economic impact analysis on food waste cogeneration at Advanced Water Recycled Centre at Upper South Creek. This demonstrated significant benefits to Sydney Water and the wider community. • Established partnerships with Jemena and the Australian Renewable Energy Agency (ARENA) to extract high quality biomethane from the Malabar treatment plant to be blended directly into the gas network. • Progressing programs to examine meaningful recovery pathways for grit removed from our WRRFs and our wastewater networks.

Environmental Issue	Key points from 2021-22 report
Community involvement	
Community awareness	Our public water stations recorded consumption of more than one million litres in 2021-22 (compared to 1.4 million litres in 2020-21).
	Sydney Water's Brand Tracker showed 71% of the 3,260 people surveyed plan to reduce water use outside the home, 50% intend to use less water in the bathroom and 43% said they would use less water in the kitchen.
	Our research has highlighted a lack of awareness as to what can safely and responsibly be flushed down the toilet, 3Ps – pee, poo and (toilet) paper – and into sinks.
	We continued to invest in and support school education programs and onsite tours.
	Our Community Sentiment Monitor provides a snapshot of what is working well and the challenges and opportunities. The community is responding positively to education against tissue flushing. However, responses to is it 'Okay to flush anything beyond human waste and toilet paper' have trended downward and indicates that further public education is required in this area.
	Key relevant initiatives • We have implemented a series of programs including Active Leak Detection, and Leak Detection Canine Program to detect water leaks in our environment. Sydney Water is currently piloting several options to ascertain which of the multiple emerging technologies are the most appropriate for water leaks and therefore water conservation. • Customer campaigns including: – 'Turn it off Bob' campaign, increasing awareness of day-to-day water usage in and around people's homes. – 'Are You Flushing Kidding Me?' and 'Best to Bin It' campaigns highlighted what can safely be flushed in toilets and what is safe to put through sinks. • In May 2022, Standards Australia released a 'flushability' standard, and Sydney Water is actively helping educate consumers on products that meet this new standard. • Our new Brand Tracker and Community Monitor tools help us understand feedback from the community.

02

Introduction

2.1 Background

As required by the *Sydney Water Act 1994* (the Act), this Annual Environmental Performance Report incorporates our statement on the implementation of our special objectives, and our Environmental Indicators Performance Report 2021-22. The Act requires us to publish our statement on the implementation of our special objectives as part of our annual report on environmental indicators.

This report summarises our environmental performance and demonstrates how we addressed the special objectives identified in the Act between 1 July 2021 and 30 June 2022.

Our business is underpinned by the three principal objectives outlined in the Act:

1. To be a successful business.
2. To protect the environment by conducting its operations in compliance with the principles of ecologically sustainable development (ESD).
3. To protect public health by supplying safe drinking water to its customers and other members of the public in compliance with the requirements of our Operating Licence.

These objectives enable us to achieve a sustainable future by balancing social, economic and environmental considerations.

In addition to this, Section 22 of the Act states that in implementing the principal objectives, we have the following special objectives:

1. To reduce risks to human health.
2. Prevent degradation of the environment.

These objectives are to be interpreted and implemented as specified in Section 22 of the Act and Section 6 of the *Protection of the Environment Administrations Act 1991*, so far as they are relevant to our business.

2.2 Implementing the special objectives

Sydney Water integrates environmental and public health management into our business-as-usual operations. The special objectives are addressed holistically so that we can carefully balance our social, economic, public health and environmental considerations. The management systems, plans and frameworks we've established to support our business operations include the:

- Environmental Management System, certified to the International Organisation for Standardisation (ISO)14001, provides a systematic, planned approach to managing environmental risks.
- Drinking Water Management System, aligned to the Australian Drinking Water Guidelines 2011, which describes the methods we use to ensure the quality and quantity of drinking water we supply to our customers.
- Recycled Water Management System, aligned to the Australian Guidelines for Water Recycling 2006, which describes the methods we use to ensure we supply high-quality recycled water to our customers and minimise risks to human health.
- Quality Management System, certified to the ISO9001 standard, enables us to continually monitor and measure how we are performing so we can improve and be more effective.
- Asset Management System, certified to the ISO55001 standard, provides a framework that supports our asset management activities to deliver customer service outcomes and continual improvement.
- General requirements for the competence of testing and calibration laboratories, ISO/IEC 17025 is the main ISO standard used by testing and calibration laboratories. Accreditation to ISO/IEC 17025 plays an important role in supporting the validity, impartiality and reliability of results from testing and calibration laboratories.

2.3 Reporting against our special objectives

2.3.1 One Strategy to deliver our vision

Sydney Water's vision – creating a better life with world class water services – is at the core of Our strategy for the 2020-2030 period. This strategy has four strategic outcomes that inform our activities and respond to the current challenges facing our customers, our business and the environment. The four outcomes are:

- **We are the First choice of customers and partners** to deliver a world-class customer experience and we collaborate with our current and future customers, communities, stakeholders and partners to deliver better outcomes
- **We have a High-performance culture** to deliver results with a focus on safety, inclusion, innovation and accountability
- **We deliver thriving, liveable and sustainable cities** with world-class, digitally enabled products and services and champion for the environment, public health and a safe and resilient water supply.
- **We are a successful and innovative business** that is socially responsible and sustains a positive return for our shareholders and the community.

FIGURE 2-1 OUR VISION, STRATEGIC OUTCOMES AND VALUES FOR THE 2020-2030 PERIOD

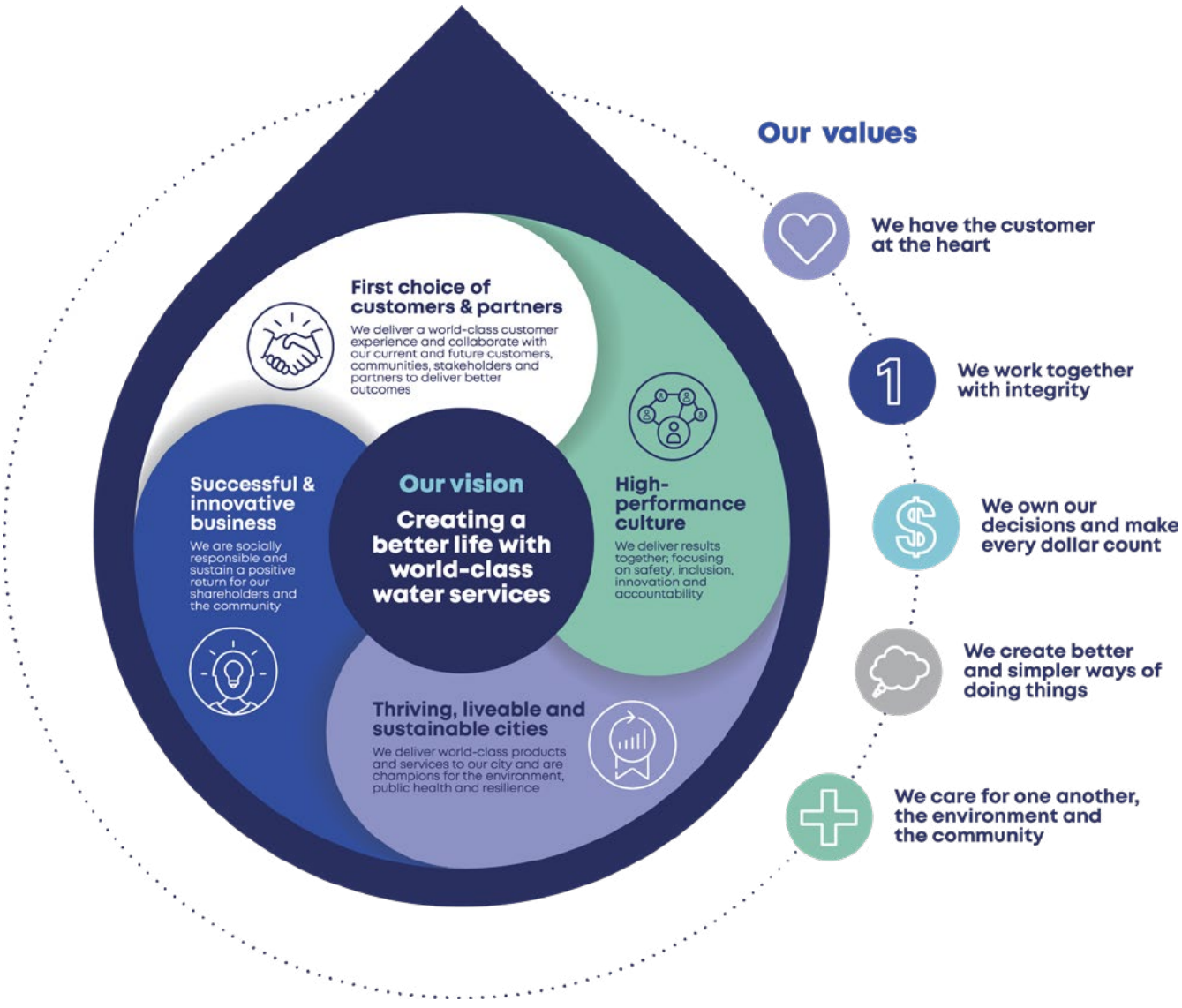


Table 2-1, lists the special objectives means specified in Section 22 of the Act and Section 6 of the *Protection of the Environment Administrations Act 1991*, and shows where this report addresses the means. All are aligned with the relevant objectives within our strategy and our vision – Creating a better life with world-class water services (2020-2030).

TABLE 2-1 REPORTING AGAINST SPECIAL OBJECTIVES REQUIREMENTS

***Sydney Water Act 1994* means**	***POEA Act 1991* means**[1]	**Link to relevant Strategy goals and enterprise areas of work**	**Where addressed in this report**
Reducing the environmental impact of discharges into or onto the air, water or land of substances likely to cause harm to the environment.	Adopting the principle of reducing to harmless levels the discharge into air, water or land of substances likely to cause harm to the environment. Setting mandatory targets for environmental improvement. Promoting pollution prevention.	Healthy Waterways & Environment Embed circular economy practices as part of our core business	Section 3 – Reduce impact of discharges to the environment Section 4 – Efficient and sustainable resource reuse Section 2 – Preparing for a changing climate
Re-using and recovering energy, water and other materials and substances, used or discharged by Sydney Water, by the use of appropriate technology, practices and procedures. Reducing use of energy, water and other materials and substances.	Encouraging the reduction of the use of materials, encouraging the re-use and recycling of materials; and encouraging material recovery.	Embed circular economy practices as part of our core business. Resource Recovery and Circular Economy practices.	Section 4 – Efficient and sustainable resource reuse • Develop and implement water conservation program • Bioresources • Maintain our grid-sourced electricity demand
Minimising Sydney Water's creation of waste by the use of appropriate technology, practices and procedures.	Minimising the creation of waste by the use of appropriate technology. Regulating the transportation, collection, treatment, storage, and disposal of waste.	Embed circular economy practices as part of our core business. Resource recovery & circular economy.	Section 4 – Efficient and sustainable resource reuse • Bioresources • Waste
	Promoting community involvement in decisions about environmental matters. Conducting public education and awareness programs about matters. Ensuring the community has access to relevant information about hazardous substances arising from, or stored, used or sold by, any industry or public authority.	Drive Innovation and make a positive social impact on our communities.	Section 5 – Community involvement • Customer satisfaction, awareness and behaviour

1 Only the means relevant to Sydney Water's activities are listed.

This report provides a holistic statement with a focus on wastewater discharges and provides trending data. In addition to this report, we publish several comprehensive performance reports on our website that demonstrate our implementation of, and performance against, the special objectives. Please refer to the following reports available at sydneywater.com.au for more information:

- Sydney Water Annual Report – provides a summary of Sydney Water's overall performance.
- Water Conservation Report – outlines how we are meeting our water conservation requirements and contributing to water efficiency, leakage management and water-recycling initiatives.
- EPA pollution monitoring data reports – we test water quality at our water resource recovery facilities (WRRFs), water filtration plants every month. We publish the results of our tests within 14 days of the last test result becoming available.

2.4 Sewage Treatment System Impact Monitoring Program (STSIMP) Report

The information in this report refers closely to the outcomes of our 2021-22 Sewage Treatment System Impact Monitoring Program (STSIMP) Data Report (Sydney Water 2022). The STSIMP was developed in consultation with the NSW Department of Planning and Environment (DPE) and implemented from July 2008, to monitor Sydney's waterways. The program was endorsed by the NSW Environment Protection Authority (EPA) in 2008 with a slight amendment to one of its sub-programs in 2010 (Sydney Water 2010).

The STSIMP aims to monitor the environment in Sydney Water's area of operations to determine general trends in water quality over time. It monitors Sydney Water's performance and determines where Sydney Water's contribution to water quality may pose a risk to environmental ecosystems and human health. It contains a summary of wastewater discharge quality, quantity and loads data for key pollutants relating to regulatory limits.

This report also contains inland and ocean receiving water quality, wastewater overflows and recycled water data. The 2021-22 STSIMP Data Report was provided to the EPA in mid-December 2022 and published to Sydney Water's web site in 2023.

2.5 Climate change

Climate change is leading to more extreme, frequent, and compounding weather events. Sydney Water's services and potential environmental impacts are interlinked with the prevailing climate.

In 2021-22, our environmental performance was affected by higher-than-average rainfall. Importantly October-March rainfall was significantly higher in all our area of operations than the long-term summer average (CBD 98%; Katoomba 90%, Camden 130%). Repeated slow-moving thunderstorms brought significant rainfall most notably in November 2021 and Feb-March 2022.

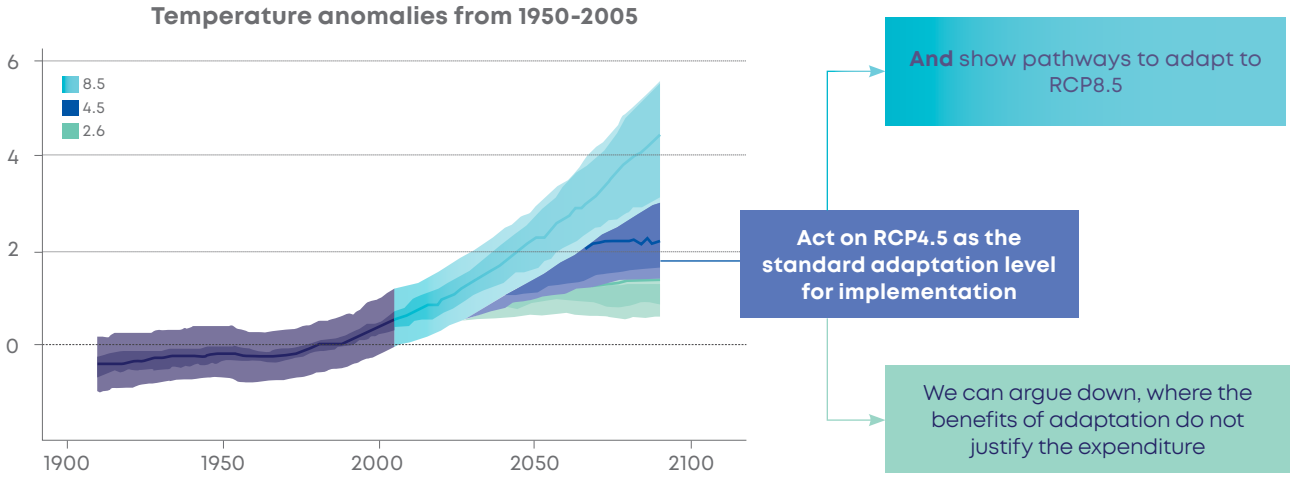
In addition to the influence of natural drivers, anthropogenic climate change continues to influence climate and the likelihood of more extreme events as we plan for an uncertain future.

In mid-2022 Sydney Water formally adopted a position statement: that we will plan and invest prudently to ensure we can maintain service levels by managing our climate risk.

Sydney Water has also adopted and will continue to adopt new methodologies to adapt to climate change, enabling us to be prepared in the face of a variable climate. New tools will be embedded into our planning and asset management practices to ensure we are planning for a plausible future climate, not a past climate.

Representative Concentration Pathways (RCPs) as shown in Figure 2-2, is a climate risk management tool providing a new standardised method of comparing potential future climates in different greenhouse gas emission pathways. The RCPs range from very high emissions (RCP 8.5) through to very low (RCP 2.6). Current industry practice is to baseline performance and design standards to historical climate data. As shown in Figure 2-2, Sydney Water recognises there is no plausible future where the climate will behave as it has in the past. Moving forward our services must be prepared for a different, uncertain climate.

FIGURE 2-2 POSITION STATEMENT ON CLIMATE CHANGE ADAPTATION[2]



In 2021-22 Sydney Water began a concerted effort to increase our organisational maturity. In practice this meant proactively identifying key projects where we could pilot changing our planning processes in-line with this new position. The basis of design and planning for the new Upper South Creek Advanced Water Recycling Centre project, Warriewood WRRF UV disinfection project, and Illawarra Regional Plan are examples of projects now aligned to RCP 4.5 climate projections.

This climate risk management tool will be implemented into all key business processes. Sydney Water will also develop a climate change adaptation guideline to provide specific advice to our teams. We continue to use the Cross-Dependency Initiative (XDI) geo-spatial climate risk application to provide forecast risk to parts of our asset base. We are also developing a range of other holistic tools to improve our understanding of compounding climate risks such as storms and sea-level rise.

2 ESOS (2016) Looking to the future with climate projections https://ecos.csiro.au/future-climate-projections/
Full ranges for CMIP raw results (across all models and ensemble runs) and WGI AR6 assessed very likely (5-95%) ranges (IPCC2022)

03 Reduce impact of discharges to the environment

Collecting and treating the community's wastewater plays an enormous role in protecting the environment from pollution and improving the health of our waterways. Our wastewater system has 29 Water Resource Recovery Facilities (WRRFs) and 14 of these facilities produce recycled water. All of our wastewater systems are licensed by the NSW EPA. Our WRRFs receive wastewater from residential, commercial and industrial customers and discharge treated wastewater to inland waterways and the ocean. In 2021-22 Sydney Water collected 698,215 ML of wastewater, servicing an estimated population of 5,161,000 people. We produced 37,693 ML of recycled water that we supplied to a population of around 100,000 people and includes environmental flows transferred from our Advanced Water Treatment Plant at St Marys to the Nepean River at Penrith.

3.1 Benefits of wastewater treatment

Healthy waterways are critical to plants and animals that live there. Our rivers are full of life, and maintaining flow is essential for their survival. Treating our wastewater not only protects public health; it protects habitats for terrestrial and aquatic life. Water also has scenic and recreational values and contributes to the quality of life that communities can enjoy, including water activities such as swimming, fishing, boating and picnicking.

3.1 Healthy waterways and our environment strategic blueprint

Sydney Water has drafted a Healthy Waterways and Environment Strategic Blueprint that sets out our pathway to world-class environmental performance and identifies how to deliver our corporate strategy outcomes to create and maintain waterways that are clean, thriving and safe for swimming. Improving our waterways is a key element of our strategy, and our vision – creating a better life with world class water services.

Our strategic blueprint will influence our business planning, our internal policies and decision making, and our planning for major projects and asset maintenance. The blueprint benefits and directions include:

Benefit 1. Rivers downstream of dams are inviting and striving

- We recover all beneficial resources from wastewater – including water for rivers to improve flow and quality.
- We support the water needs of our city and waterways by supporting wise water use and using all supply options.

Benefit 2. Urban streams are valued, appealing and healthy

- We prevent wastewater pollution. We prevent, respond to and reduce the impact of overflows, leaks, discharges and odour.
- We improve management of urban waterways and stormwater by integrating place and water planning.

Benefit 3. Coasts and estuaries are suitable for swimming and resilient

- We recover all beneficial resources from wastewater – including from our coastal wastewater systems.
- We implement effective control of pollution at source.

Benefit 4. Landscapes and nature are protected, connected and enjoyed

- We conserve, restore and connect nature and waterways.
- Our land management and resource recovery practices enable healthy, productive land and soil.

And the following common directions across all benefit areas:

- In collaboration, we improve swim site suitability and deliver more waterway swimming and recreation opportunities
- We improve climate change resilience in our wastewater and stormwater networks

3.1.2 Impacts on swimming locations

The water quality of beaches and other swimming locations is monitored under the NSW Government's Beachwatch programs. Beachwatch suitability grades provide an assessment of the suitability over time of a swimming location for recreation. There are five grades ranging from Very Good to Very Poor.

In 2021-22, the BeachWatch program (DPE) monitored 115 sites within the Sydney Water area of operations. There were 928 observations where Enterococci (measured in colony forming units per 100 mL(cfu/100mL)) levels were above the primary contact guideline (>35 cfu/100 mL) at Beachwatch and Harbourwatch sites. Greenhills Baths from Southern Sydney was the only site where the primary contact guideline was maintained under all weather conditions. Out of the 928 observations, 161 exceedances were recorded during dry weather based on the assessment of high conductivity (>30,000 µS/cm) and no rainfall (72 hours rainfall <2mm). These 161 dry weather exceedances were from 78 beaches and are subject to further investigation. The investigation focused on assessing data collected under Sydney Water's Environmental Response (ER) and Dry Weather Leakage Program (DWLP) projects. All sampling data for these projects was extracted and then filtered by sites that exceeded the primary contact guideline. The site list was rationalised to include only wastewater inflow points – the point at which a surcharge reaches any waterway – or any site sampled that is deemed to be a primary or secondary contact waterway. The sampling information was then mapped against the 173 Beachwatch exceedances. Any site sampled under the ER or DWLP projects that met the above criteria and occurred within 7 days before and 7 days after the Beachwatch exceedance was deemed to have a potential impact.

Using the above methodology for 2021-22 data, wastewater overflows from Sydney Water's networks may have contributed to elevated Enterococci at 18 of the 115 Beachwatch sites (17% of all sites) on 21 occasions. Seventeen of these sites had only one incident. There were four incidents at Woolwich Baths during 2021-22 when Sydney Water's network may have contributed to these exceedances (Table 3-1).

Twenty-six wastewater overflows impacted sites and respective beach suitability grades as determined by DPE (previously DPIE) (DPIE 2021 and DPIE 2020) over the last 2 years. The beach suitability grades deteriorated at four of these sites and were stable at the remaining sites compared to the 2020-21 results.

- Eight of the sites were consistently impacted by wastewater overflows for the last two consecutive years. These were Bronte Beach, Coogee Beach, Chinamans Beach, Foreshore Beach, Lilli Pilli Baths, Parsley Bay, Rose Bay Beach and Lake Illawarra Entrance Lagoon.
- Two of the four sites where beach suitability grades deteriorated were consistently impacted by wastewater overflows for the last two years (Coogee Beach and Rose Bay Beach). Whereas Jew Fish Bay Baths were impacted by wastewater overflows in 2021-22, and Oatley Bay Bath was impacted by wastewater overflows in 2020-21.

Sydney Water is currently conducting programs of work to reduce overflows to Rose Bay Beach and Foreshore Beach. Please also refer to section 3.8 for further details on improvements in our wastewater network performance.

TABLE 3-1 SUMMARY OF BEACHWATCH PROGRAM CHANGES IN SUITABILITY GRADE FOR SITES IMPACTED BY SYDNEY WATER'S OPERATIONS IN 2021-22 BASED ON KNOWN DRY WEATHER OVERFLOWS

LEGEND: NO CHANGE, INDICATES STABLE UPGRADE, INDICATES IMPROVEMENT DETERIORATED
GOOD/VERY GOOD FAIR POOR/VERY POOR

Site	Beach suitability grade	Potential impact from wastewater overflows	Change from 2020-21	Comments
Bronte Beach	Good	✓	→	No change
Coogee Beach	Poor	✓	↓	Deteriorated
Cabarita Beach	Good	✓	→	No change
Chinamans Beach	Good	✓	→	No change
Clontarf Pool	Good	✓	→	No change
Foreshores Beach	Poor	✓	→	No change
Frenchmans Bay	Poor	✓	→	No change
Gunnamatta Bay Baths	Good	✓	→	No change
Hayes Street Beach	Good	✓	→	No change
Jew Fish Bay Baths	Poor	✓	↓	Deteriorated
Little Manly cove	Good	✓	→	No change
Lilli Pilli Baths	Good	✓	→	No change
Oatley Bay Baths	Poor	-	↓	Deteriorated
Parsley Bay Baths	Good	✓	→	No change
Rose Bay Beach	Poor	✓	↓	Deteriorated
Tambourine Bay	Poor	✓	→	No change
Woodford Bay	Good	✓	→	No change
Woolwich Baths	Good	✓	→	No change
Lake Illawarra Entrance Lagoon	Good	✓	→	No change

3.2 Environmental Impact Index (overall measure)

Caring for and protecting the environment is a core value in everything we do at Sydney Water. We have developed an Environmental Impact Index (EII) to track our overall progress towards achieving 'thriving, liveable and sustainable cities' (one of our four strategic outcomes).

The EII considers and appropriately weights all of Sydney Water's significant environmental aspects in its calculation. An environmental aspect is an element of our organisation's activities, products or services that interacts or can interact with the environment. The following aspects were identified as significant for Sydney Water, and are ordered from highest to lowest weighting within the EII:

- Wastewater discharge
- Emissions
- Resource recovery/disposal
- Odour generation
- Water discharge
- Vegetation disturbance
- Chemical and fuel spill
- Heritage disturbance
- Noise generation

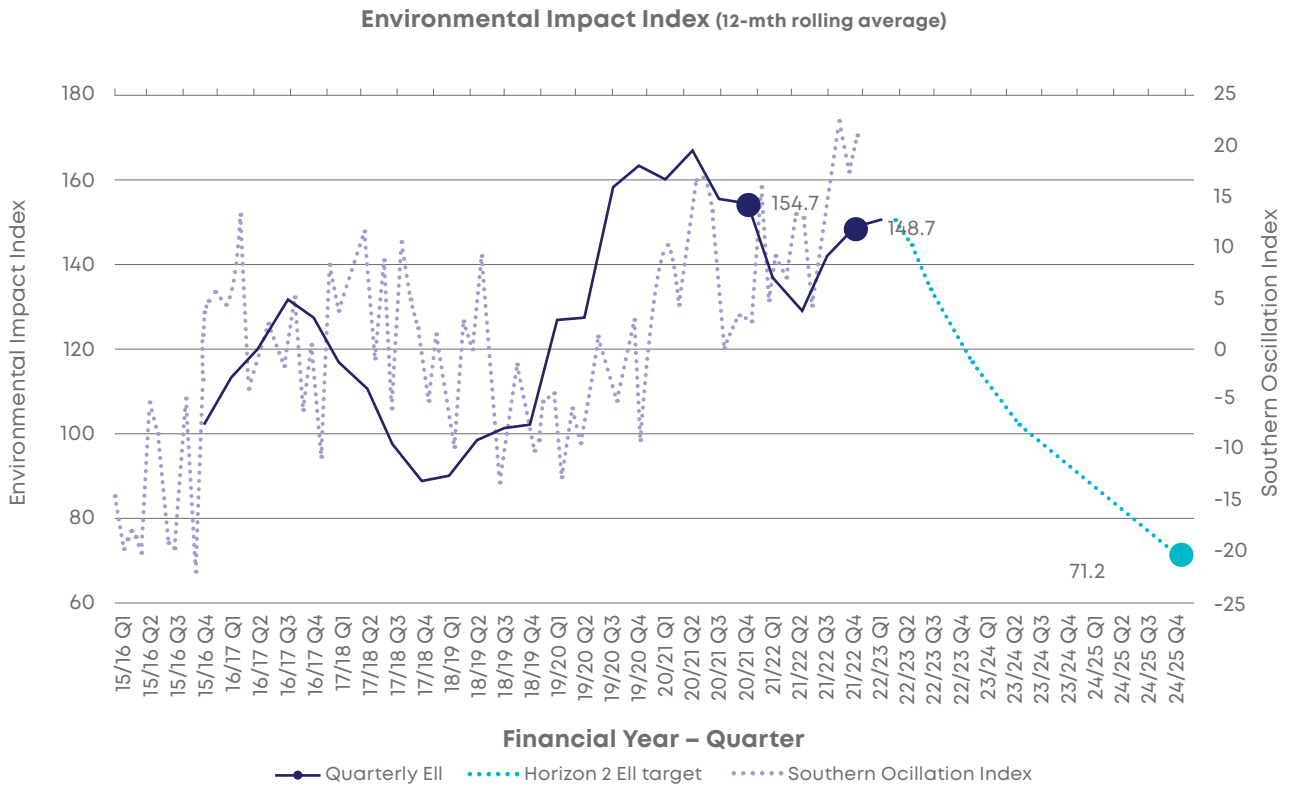
These aspects may have adverse or beneficial impacts on the environment, which can result in risks and opportunities for Sydney Water.

The EII is a number that indicates the overall environmental impact of our organisation. We track the EII quarterly, which supports the organisation to proactively address areas of concern and move towards achieving our environmental aspirations defined within our Sydney Water Strategy 2020-30. Key aspirations include reducing our environmental impact and carbon footprint and contributing to world-class waterways.

Figure 3-1 shows how our quarterly EII results have changed over recent years. The Southern Oscillation Index (SOI) is also displayed alongside the EII. The SOI gives an indication of the development and intensity of El Niño or La Niña events in the Pacific Ocean, which have an influence on our environmental performance. Sustained negative values of the SOI below −7 often indicate El Niño episodes. Sustained positive values of the SOI above +7 are typical of a La Niña episode.

Caring for and protecting the environment is a core value in everything we do at Sydney Water.

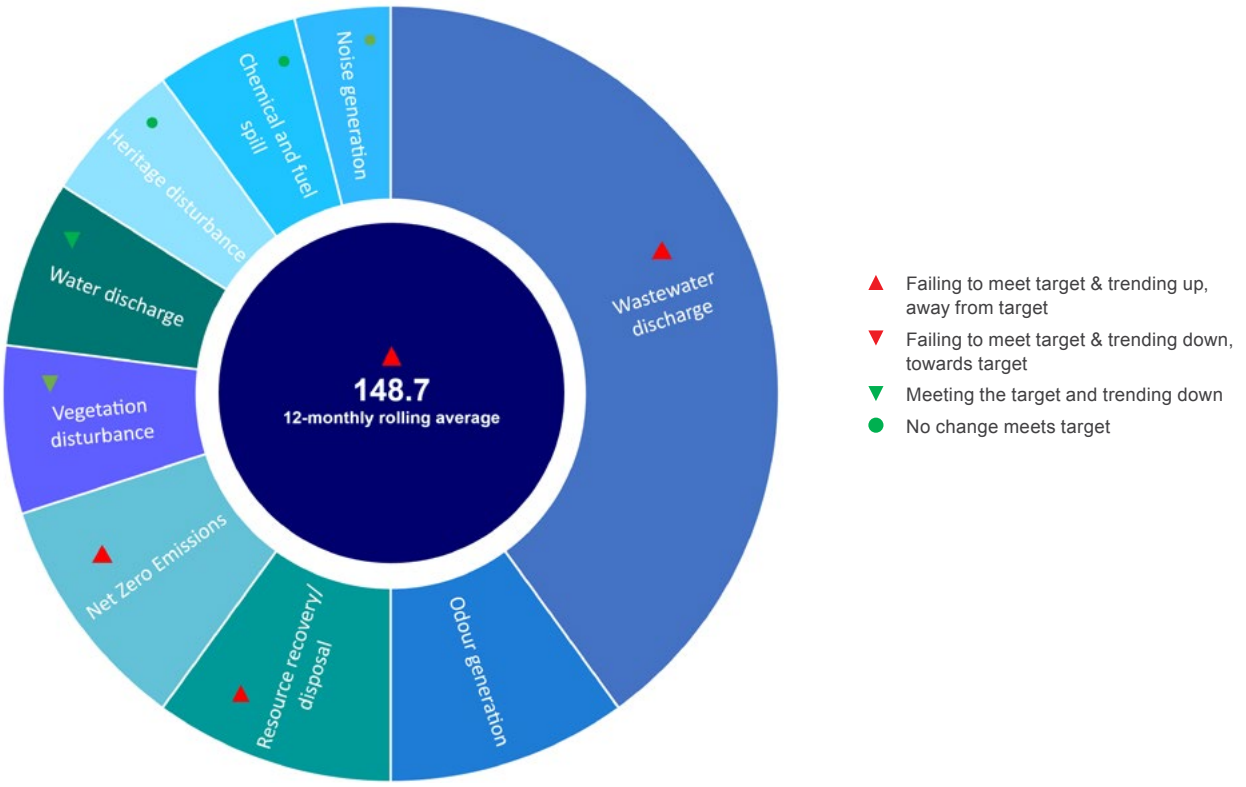
FIGURE 3-1 HISTORICAL ENVIRONMENTAL IMPACT INDEX



Our EII was calculated to be 148.7 at the end of 2021-22 (**Figure 3-2**). The EII is trending towards our 2025 target compared to Q4 2020-21 (154.7) and Q4 2019-20 (162.5). We recognise that we still require substantial gains in this area and we are wholly committing to achieving the target. The key input metrics affecting performance of the EII for the end of 2021-22 included:

- An improvement in many wastewater discharge performance metrics including:
  - A lower number of dry weather overflow incidents from our wastewater networks, attributable to abatement activities and wet weather conditions
  - A lower quantity of suspended solids discharged from our deep ocean outfall facilities
  - A decreasing trend in oil and grease discharges from our ocean plants since the COVID-19 pandemic
  - Fewer Beachwatch exceedances, but still above our target this could be attributable to various activities conducted to eliminate low quality direct discharges and reduce overflows
- An increase in the estimated nutrient load calculation because of wet weather at our inland WRRFs
- A slight increase in net greenhouse gas emissions compared to 2021-22. Due to wet weather there was lower renewable energy production that caused increased grid electricity usage for operation
- An increase in waste sent to landfill, mainly due to an increase in construction works for our major projects.
- A lower number of odour complaints compared to 2020-21, mainly attributable to a lower number of dry weather overflows from our wastewater networks.
- A higher area of native vegetation cleared compared to the previous year. This again is mainly due to an increase in construction works for our major projects.

FIGURE 3-2 QUARTERLY ENVIRONMENTAL IMPACT INDEX (Q4) 2021-22

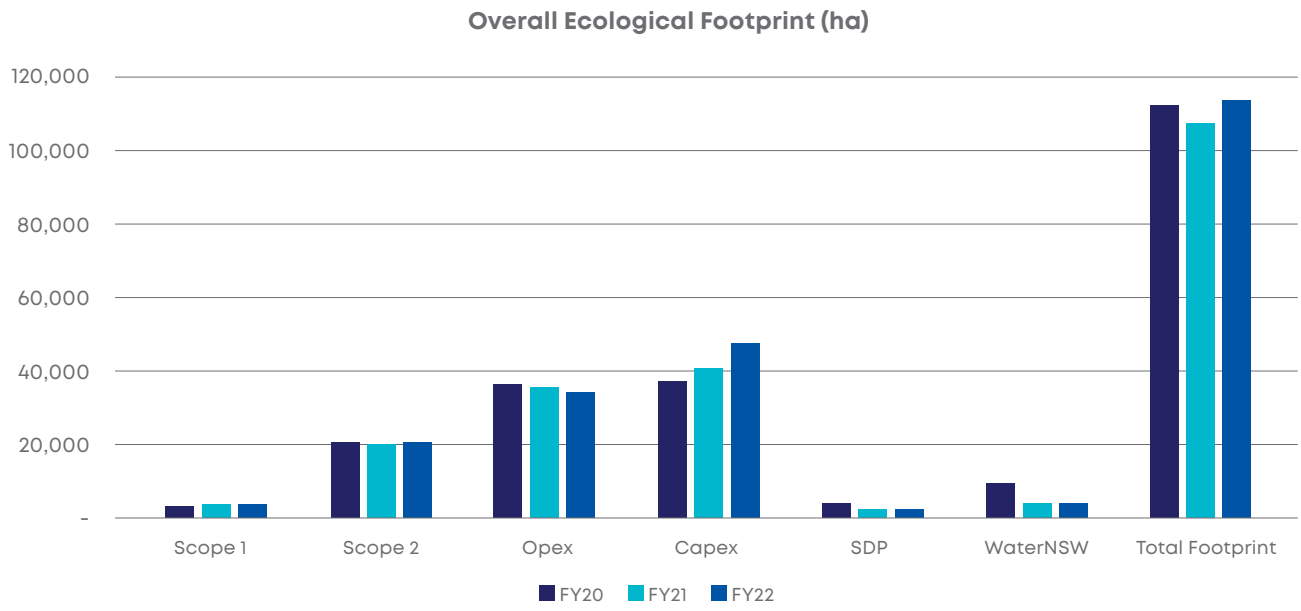


3.3 Ecological and carbon footprints

We continued to calculate our ecological footprint (Figure 3-3) and carbon footprint (Figure 3-4). Sustainability software provider Areté Sustainability was engaged to calculate our ecological footprint. The ecological footprint methodology combines detailed direct organisation impacts (Sydney Water land use data, scope 1 and scope 2 emissions) with full supply-chain carbon emissions (scope 3 sources) and all supplier land disturbance impacts, to yield a comprehensive ecological (and carbon) footprint measurement.

For 2021-22, Sydney Water's total ecological footprint from all sources (including direct, indirect, and Scope 1, 2 & 3 sources) was 114,000 ha, representing an approximate 6% increase over the total in 2020-21. The major driver for this increase is the significant increase in capital infrastructure projects between 2020-21 and 2021-22. The breakdown of the total ecological footprint is shown below. Both the footprints from the desalinated water purchase and the water delivery from WaterNSW decreased from 2019-20 to 2021-22 as drought conditions eased.

FIGURE 3-3 ECOLOGICAL FOOTPRINT 2021-22



3.4 Embracing circular economy

Sydney Water's vision to create a better life with world-class water services considers that resources can be both valuable and limited and it's the way we use water, energy and materials that helps cities thrive.

We are developing a circular economy and resource recovery strategic blueprint, with the commitment to apply the circular economy principles throughout our operations. The successful transition to a circular economy requires Sydney Water to think beyond the traditional approaches to water, energy, carbon and materials. We are working to understand the synergies, interlinkages and trade-offs to identify how to minimise our ecological footprint. To achieve this Sydney Water is developing innovative partnerships with customers, businesses, communities and all levels of government.

Our approaches are based on those developed by the Ellen MacArthur Foundation (EMF)[3] an international organisation at the forefront of circular economy. The three key principles for circular economy are:

- Design out waste and pollution,
- Keep resources in use at their highest value, and
- Restore and regenerate natural systems.

In addition to the development of the strategic blueprint, Sydney Water investigated the circular economy potential in Western Sydney and specifically the proposed Advanced Water Recycling Centre (AWRC) in Western Parkland City. This has resulted in the development of a white paper to demonstrate a shared vision for the Western Parkland City, and economic impact analysis on AWRC by the Institute for Sustainable Futures. It concluded that the AWRC had the potential to divert up to 30,000 tonnes of organic waste from landfill per year by 2030, with the biogas used to generate electricity, and benefits for jobs, emissions, and the wider economy. Every $1 million spent on turning food waste into energy generates $2.67 million worth of value right across the economy.

Work has also commenced on the Malabar Biomethane Project. This is a co-funded project by Jemena and ARENA. It will be a first in Australia to blend biomethane from the wastewater treatment plant directly into the gas network. The initial capacity of 95 Terajoules (TJ) of gas per year is expected to meet the needs of approximately 6,300 local homes.

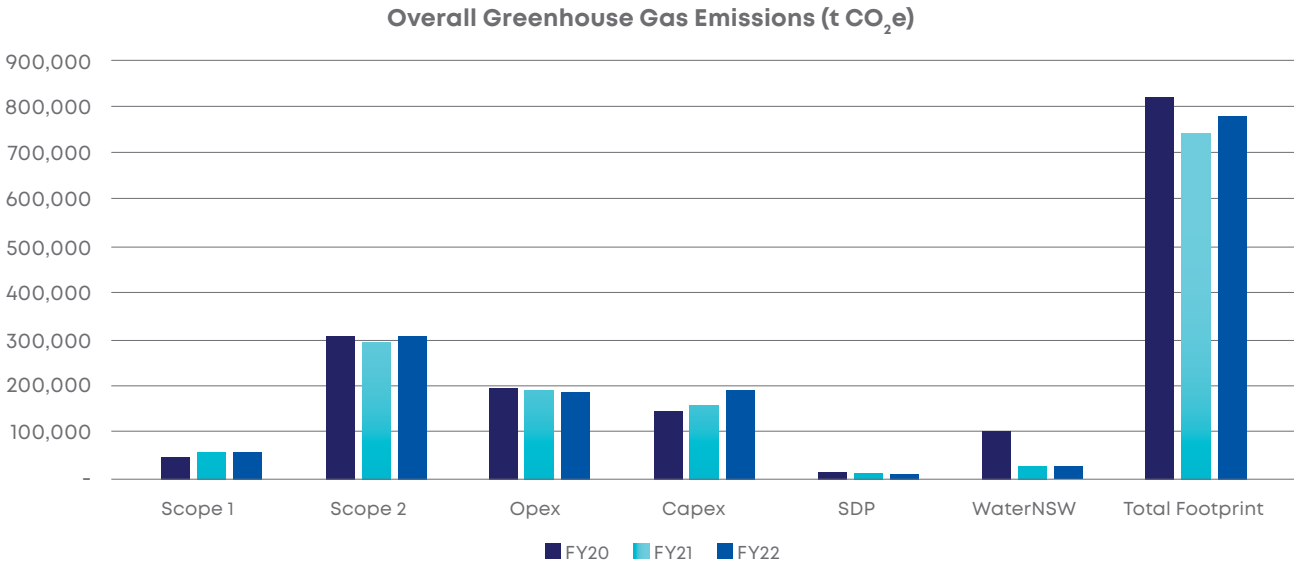
3 https://ellenmacarthurfoundation.org/

3.5 Countdown to Net Zero Carbon

Sydney Water's circular economy approach will help us achieve Net Zero Carbon. Sydney Water's strategy recognises the importance of climate change abatement to enable our *Thriving, liveable and sustainable cities* strategic outcome. As part of our response to climate change, we have an internal target of Net Zero Carbon across our business by 2030, and across our supply chain by 2040. We know two-thirds of our carbon footprint is related to our supply chain and we are working with our suppliers to ensure we reach our Net Zero Carbon goal by 2040. We will achieve our Net Zero Carbon emissions ambition through renewable energy projects and championing circular economy principles – particularly resource recovery in the form of energy, agricultural nutrients and much more. Some of our suppliers already measure their emissions and a few already have their own Net Zero Carbon plan in place.

The total carbon footprint for 2021-22 was 783,000 t CO2-e (Scope 1, 2 and 3), with the breakdown shown in Figure 3-4. The largest contribution was from Scope 2 emissions, approximately 305,000 t CO2-e. Electricity emissions associated with bulk water supply from WaterNSW decreased by nearly 50,000 t CO2-e from 2019-20 to 2020-21 and were similar in 2021-22. Capital expenditure increased significantly from 2020-21 to 2021-22, being the main driver of the increase in the capital activity components of the carbon footprint, and indeed the main change responsible for the overall increase in the carbon footprint. We are working to reduce the carbon emissions per dollar capex, such as looking at products with greater recycled content (e.g. concrete) and working with our suppliers to reduce their emissions.

FIGURE 3-4 CARBON FOOTPRINT 2021-22



3.6 Wastewater treatment discharges - coastal facilities

About 85% of wastewater collected by Sydney Water is treated at Water Resource Recovery Facilities (WRRFs) before being released to the ocean. There are three major coastal facilities located at North Head, Bondi and Malabar and five smaller coastal facilities at Warriewood, Cronulla, Bombo, Wollongong and Shellharbour. We treat about 62% of Sydney's wastewater at the three largest WRRFs (North Head, Bondi and Malabar). These facilities disperse primary treated wastewater through the three deep ocean outfalls about two to four kilometres offshore, where the water is 60 to 80 metres deep. Strong ocean currents further dilute the treated wastewater. The deep ocean outfalls play a key role in keeping our beaches and swimming areas clean (Manning et al, 2019).

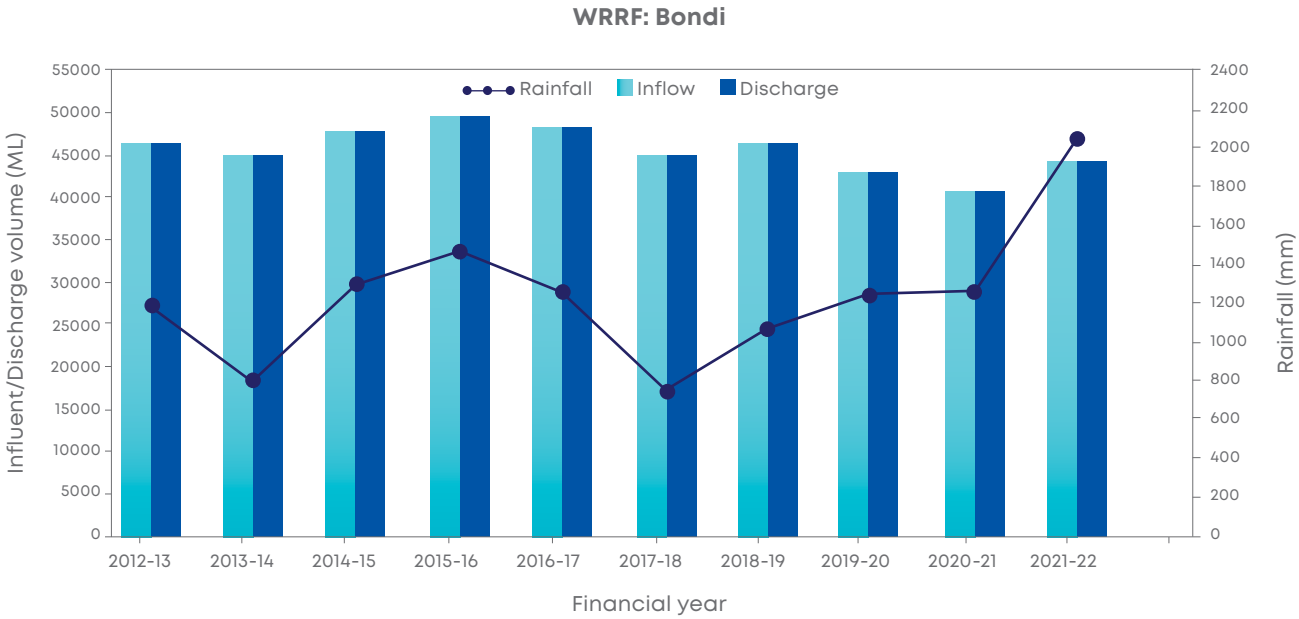
In this section we focus on the three deep ocean outfall facilities (Bondi, Malabar and North Head WRRFs). All other ocean WRRFs performed as expected during 2021-22 (within their annual EPL limits) and thus are not discussed here.

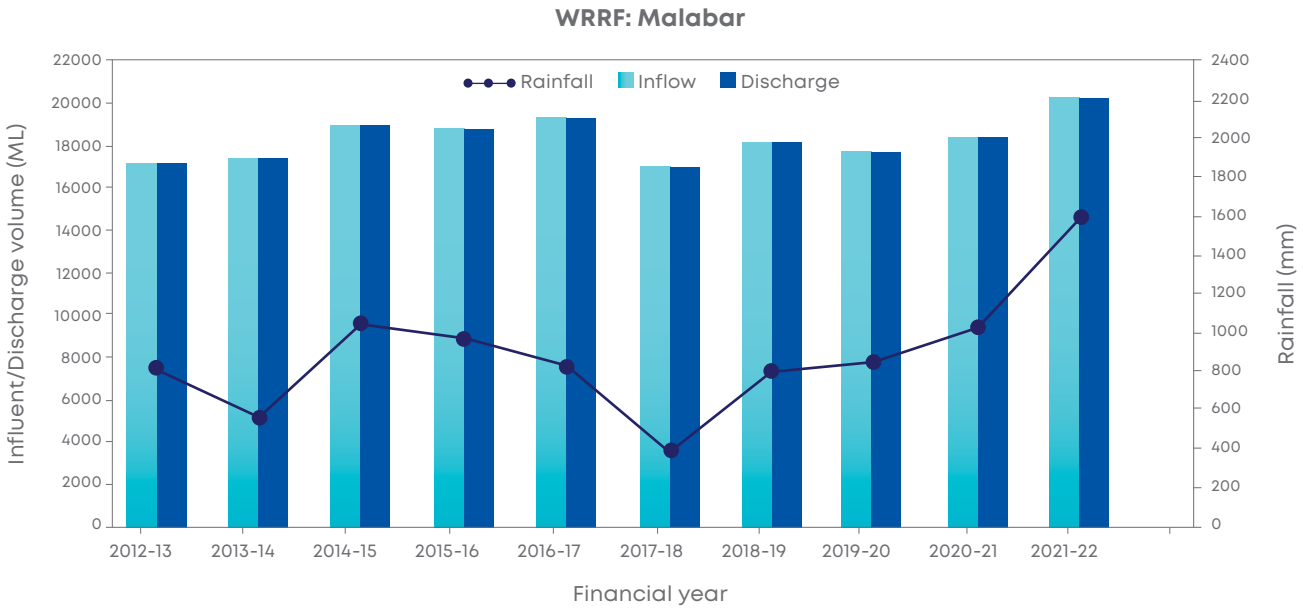
3.6.1 Inflow

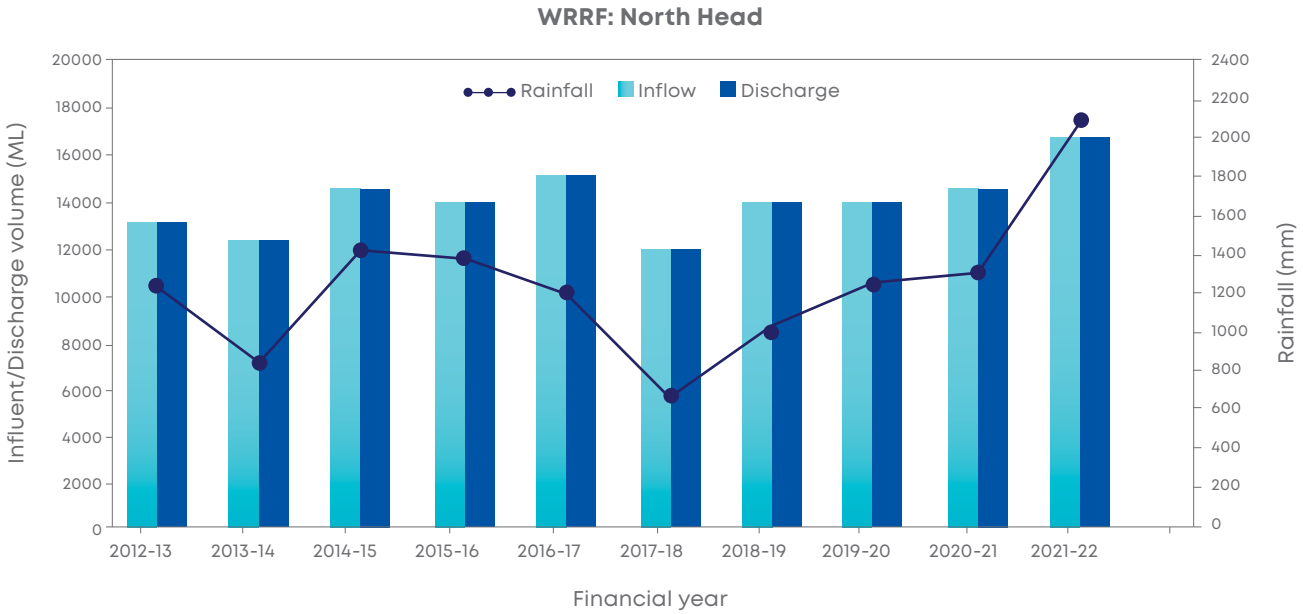
Total wastewater inflows to the deep ocean outfall facilities are shown in **Figure 3-5** and include:

- Bondi WRRF – Increased wastewater flows to this WRRF could be attributable to wet weather and an ongoing increase in people returning to the Sydney CBD for work and recreational purposes, due to easing of COVID-19 restrictions.
- Malabar WRRF – The inflow volume to this WRRF increased between 2019-2022, but less than anticipated due to reduced saltwater ingress following system-wide improvement works.
- North Head WRRF – Received 14% higher inflow compared to 2020-21 due to the significant wet weather especially during February to April 2022.

FIGURE 3-5 DEEP OCEAN OUTFALLS WRRFS INFLOW/ DISCHARGE





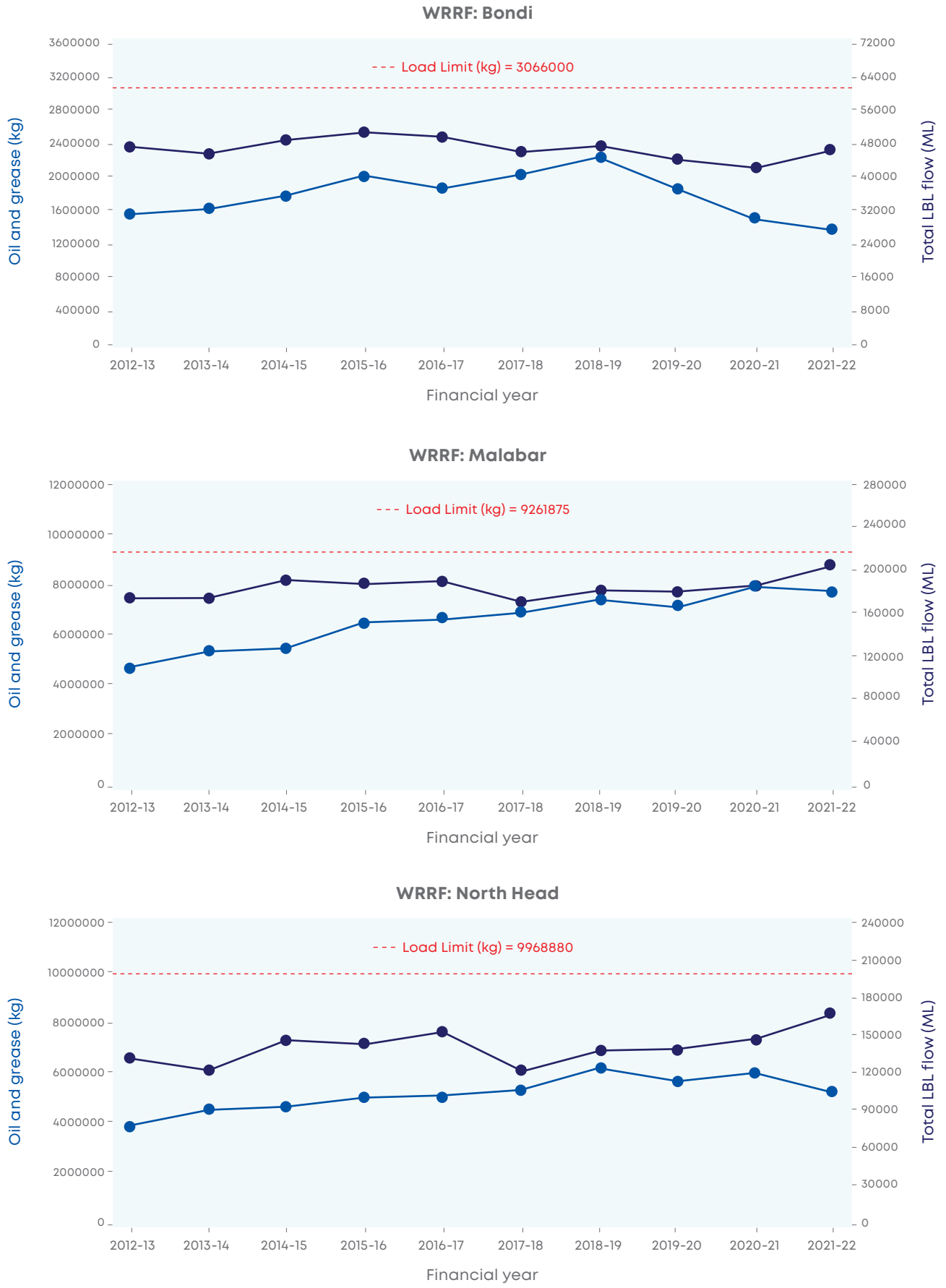


3.6.2 Oil and grease

The oil and grease load within our treated wastewater discharged from Bondi WRRF continued to drop in 2021-22. This trend was first observed in 2019-2020 when the COVID-19 pandemic began. As COVID-19 restrictions ease and customer behaviours continue to evolve, further variation to influent composition could be expected. North Head WRRF also showed a decreasing trend in oil and grease which is an improvement compared to the year 2020-21.

Malabar WRRF was impacted by several trade waste incidents in 2021-22 that impacted the oil and grease removal efficiency of the primary sedimentation process, however, was lower than 2020-21. We are exploring options to better monitor the upstream wastewater network using volatile organic carbon (VOC) monitors at pre-determined locations to provide an early warning detection system in the event of a trade waste incident. We are also continuing to collaborate with trade waste customers and the NSW EPA. As shown in Figure 3-6, oil and grease loads can vary over time.

FIGURE 3-6 DEEP OCEAN OUTFALLS WRRFS OIL & GREASE LOAD



Note: LBL – Load-based license

In late 2021 Sydney Water launched a campaign called "It's Best to Bin it" in an effort to reduce the oil and grease into our wastewater system. The objective of the campaign was to influence the behaviours of our business customers to manage their wastewater better and ultimately reduce the amount of fats, oils and grease entering our system. In conjunction with this campaign, we partnered with Restaurant & Catering Australia (R&CA) to educate business customers in the retail food sector about the sustainable management of water and waste. We did this by offering customers access to a free online course which covers a range of topics including:

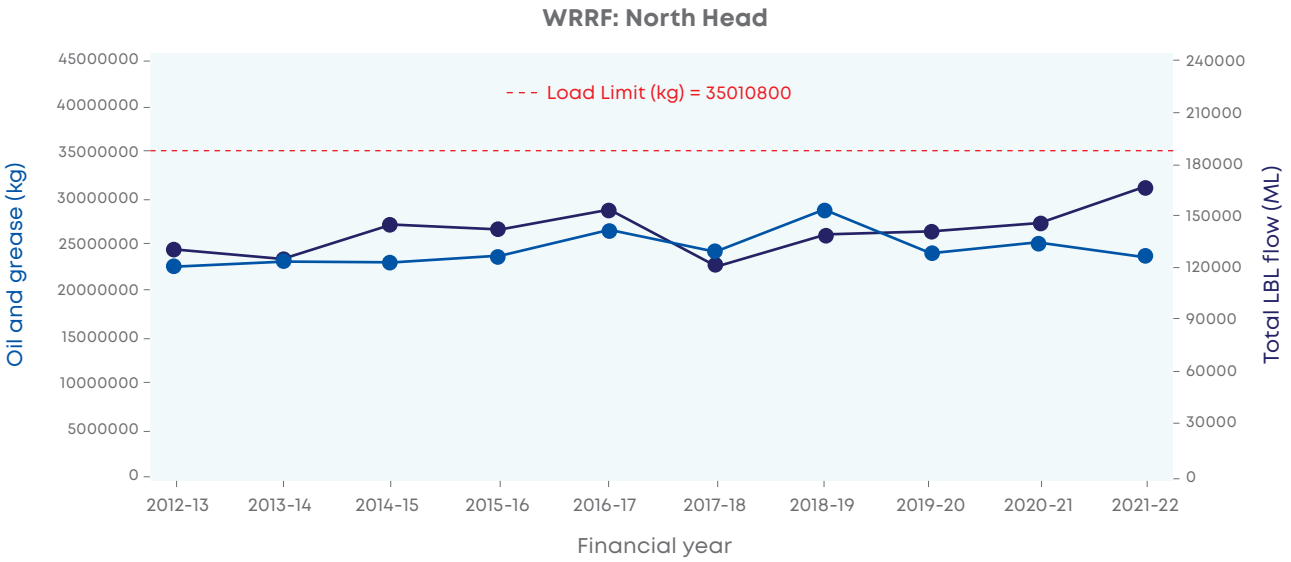
- Managing and disposing of food waste
- Managing used cooking oil
- Cleaning practices
- Treatment equipment
- Water conservation.

We also carried out planning in preparation for the rollout of a focused trade waste compliance program in the Bondi WRRF catchment in late 2022. The program targets the retail food sector, with an aim to ensure the appropriate management of trade wastewater at source, prior to entry into our wastewater network.

3.6.3 Total suspended solids

Total suspended solids concentrations in our treated wastewater discharges continued to drop in 2021-22 at Bondi WRRF. A decreasing trend was observed since 2019-2020 when the COVID-19 pandemic began. As COVID-19 restrictions ease and customer behaviours continue to evolve, further variation to influent composition could be expected in future. At Malabar WRRF, the increasing suspended solids trend can be linked to operational issues with the primary sedimentation tanks, caused by a prolonged trade waste issue within the Malabar wastewater system. There was a decreasing trend in total suspended solids during 2021-22 at North Head WRRF.

FIGURE 3-7 DEEP OCEAN OUTFALLS WRRFS TOTAL SUSPENDED SOLIDS LOAD



3.7 Wastewater treatment discharges – inland facilities

About 15% of wastewater collected by Sydney Water is treated at inland WRRFs. Sydney Water's inland facilities discharge into the Hawkesbury-Nepean River system. Considerable urban growth is occurring across the Hawkesbury-Nepean catchment and is expected to continue for at least 30 years to accommodate Sydney's expanding population. This provides the opportunity to deliver water services in new and better ways.

To understand the potential impacts to wastewater services, water services and the environment, we use our water quality and hydrodynamic model of the Hawkesbury-Nepean catchment to test different catchments, environmental flows, wastewater and land-use options over time.

We are working collaboratively with the NSW EPA in its review of the regulatory framework for nutrient discharges into the Hawkesbury-Nepean River system. With insights from our Hawkesbury-Nepean water quality and hydrodynamic model, as well as community involvement, the new regulatory framework will enable smarter integrated water solutions that provide the best balance of social, economic and environmental outcomes for the Hawkesbury-Nepean catchment area.

3.7.1 Total nitrogen (TN) and total phosphorus (TP)

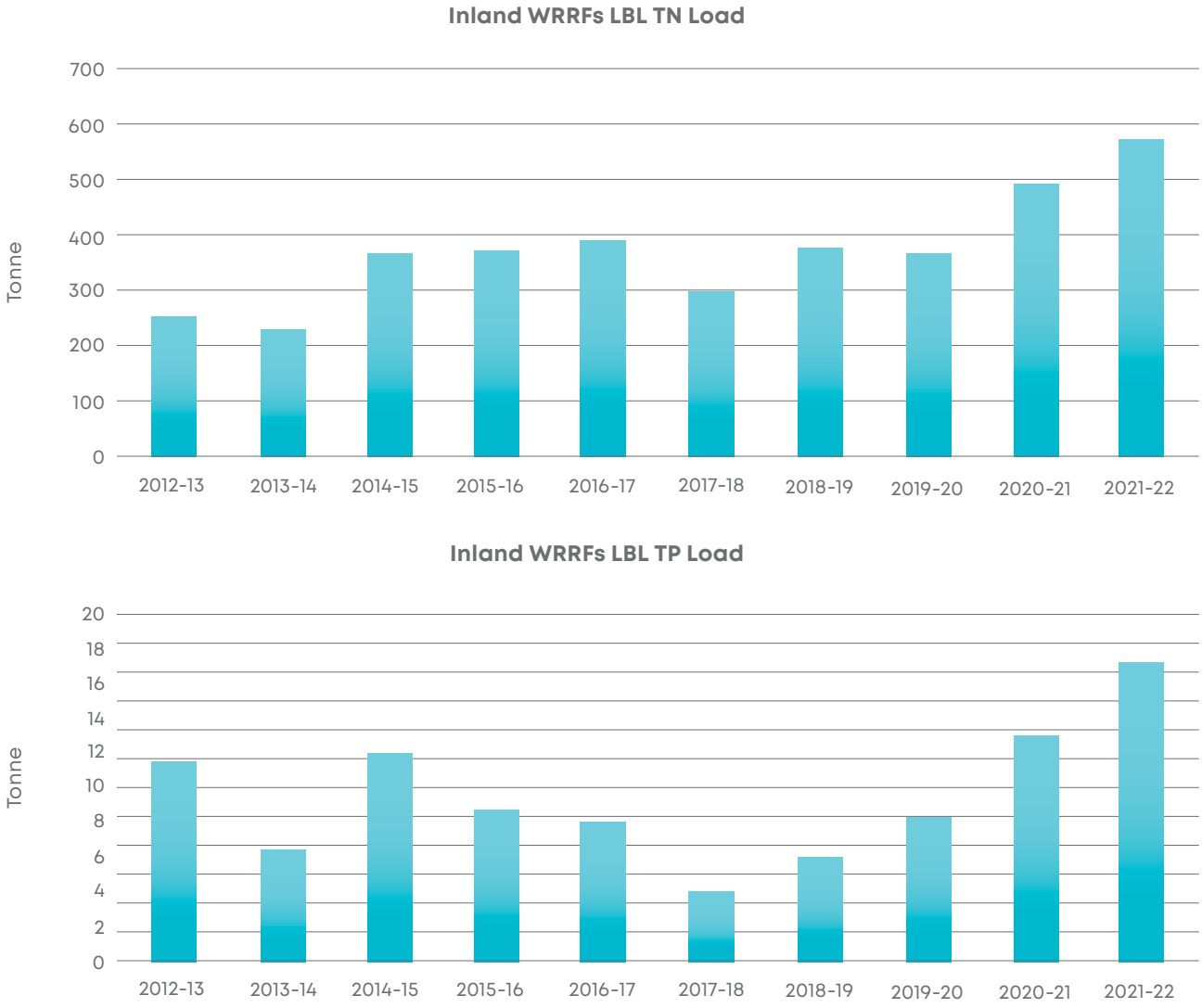
Treated wastewater discharges total nitrogen and total phosphorus loads from Sydney Water and Hawkesbury City Council, are divided by WRRFs discharging into three river zones and several subzones. The WRRFs in these zones and the subzones are presented in Table 3-2. The annual total load discharged during 2021-22 into the Yarramundi, Sackville and Berowra zones were significantly below the EPA limits except for Subzone 2 in the Sackville zone, where the total phosphorus aggregate (bubble) load exceeded 2,300 kg/year (4,971.2 kg discharged in 2021-22 compared to 3,689.3 kg discharged in year 2020-21) (Table 3-2). The exceedance in total phosphorus aggregate load from South Creek facilities (Quakers Hill, Riverstone and St Marys WRRFs) was caused largely by significant wet weather during February to April 2022.

TABLE 3-2 TOTAL LOAD OF NITROGEN AND PHOSPHORUS (KG) FROM INLAND WRRFS DISCHARGED INTO HAWKESBURY-NEPEAN CATCHMENT ZONES OVER 2021-22

Zones	WRRF	Total Nitrogen (kg)		Total Phosphorus (kg)	
		Limits	Actual	Limits	Actual
Yarramundi Zone					
Subzone 1	West Camden	91,980	98,669.7	2,190	379.4
	Picton	1,460	5,840.3	73	167
Subzone 2	Winmalee	110,595	100,245.1	6,687	4,037.9
	Penrith	176,660	38,656.9	8,030	1,810.3
	Wallacia	12,410	2,237.1	1,606	66.7
Sackville Zone					
Subzone 1	Richmond	43,800	5,805.6	10,877	39.8
	North Richmond	7,118	3,248.8	803	108.2
Subzone 2	(South Creek Bubble)	222,000	163,026.6	2,300	4971.2
	Riverstone	N/A	14,180.3	N/A	138.4
	St Marys	N/A	64,320.8	N/A	3,009.9
	Quakers Hill	N/A	84,525.5	N/A	1,822.9
Subzone 3	Castle Hill	72,270	48,747.1	2,300	1,670.9
	Rouse Hill	124,100	57,285.2	4,453	287.8
Berowra Zone					
	Hornsby Heights	72,270	14,824.3	2,300	1,113.2
	West Hornsby	80,300	32,500	4,643	1,941.6

Red font indicates exceedances

FIGURE 3-8 TOTAL PHOSPHORUS AND TOTAL NITROGEN RELEASED FROM INLAND WRRFS



Total nitrogen load discharge load exceedances

West Camden WRRF experienced increased inflows from a combination of population growth and wet weather within the catchment, which caused the facility to operate above its design capacity and applied pressure on the biological treatment process. West Camden WRRF is currently being upgraded to service development in South-West Sydney.

Picton WRRF experienced total nitrogen load exceedances due to a series of wet weather events mostly between February and April 2022, resulting in greater inflow into Picton WRRF.

Total phosphorus load discharge load exceedances

Picton WRRF total phosphorus load exceedances were again due to a series of wet weather events mostly between February and April 2022, resulting in greater inflow into Picton WRRF. We are investigating an effluent management strategy for Picton WRRF.

South Creek Bubble (Riverstone, St Marys and Quakers Hill WRRFs) annual total phosphorus aggregate load discharged was exceeded. The exceedance was caused by extreme wet weather between February and April 2022. St Marys WRRF contributed 60.5% of this total phosphorus aggregated load, whilst Quakers Hill WRRF contributed 36.7% of the load and then Riverstone WRRF contributed the lowest portion of the load at 2.8%.

The Lower South Creek Treatment Program is providing new and upgraded wastewater infrastructure to improve the quality, capacity and reliability of these three facilities.

3.7.2 Hawkesbury-Nepean Riverine Environment

Water quality and phytoplankton

Under our Sewage Treatment System Impact Monitoring Program (STSIMP) (Sydney Water, 2022), the receiving water quality of the Hawkesbury-Nepean River was assessed via monitoring key nutrients, chlorophyll-a, phytoplankton and other physico-chemical analytes at 13 sites along the Hawkesbury-Nepean River from the upstream freshwater reaches of the Nepean River. Another five sites were monitored at four major tributaries, South Creek, Cattai Creek, Colo River and Berowra Creek. The 2021-22 median total phosphorus concentration exceeded the ANZG (2018) guideline at eight of the 18 monitoring sites. These included the Nepean River sites at Wallacia and Yarramundi, four Hawkesbury River sites downstream of South Creek, and two major tributary sites (South and Cattai creeks).

Extreme wet weather contributed to decreasing or stable chlorophyll-a trends at most sites. The only exception was Berowra Creek off Square Bay where chlorophyll-a increased in 2021-22. Despite this decreasing/stable trend at most sites, the 2021-22 median chlorophyll-a concentrations exceeded the ANZG (2018) guideline at 16 of 18 monitoring sites. The exceptions were Nepean River at Penrith Weir and the reference site on the Colo River.

There was no significant temporal trend in total phytoplankton biovolume at any site. However, blue-green, toxic blue-green biovolume and counts increased significantly at Wilberforce Hawkesbury River and decreased significantly at Leets Vale on the Hawkesbury River. During 2021-22, the median biovolume or counts of the total blue-green or potentially toxic blue greens were less than the Amber alert (NHMRC, 2008) at all monitoring sites.

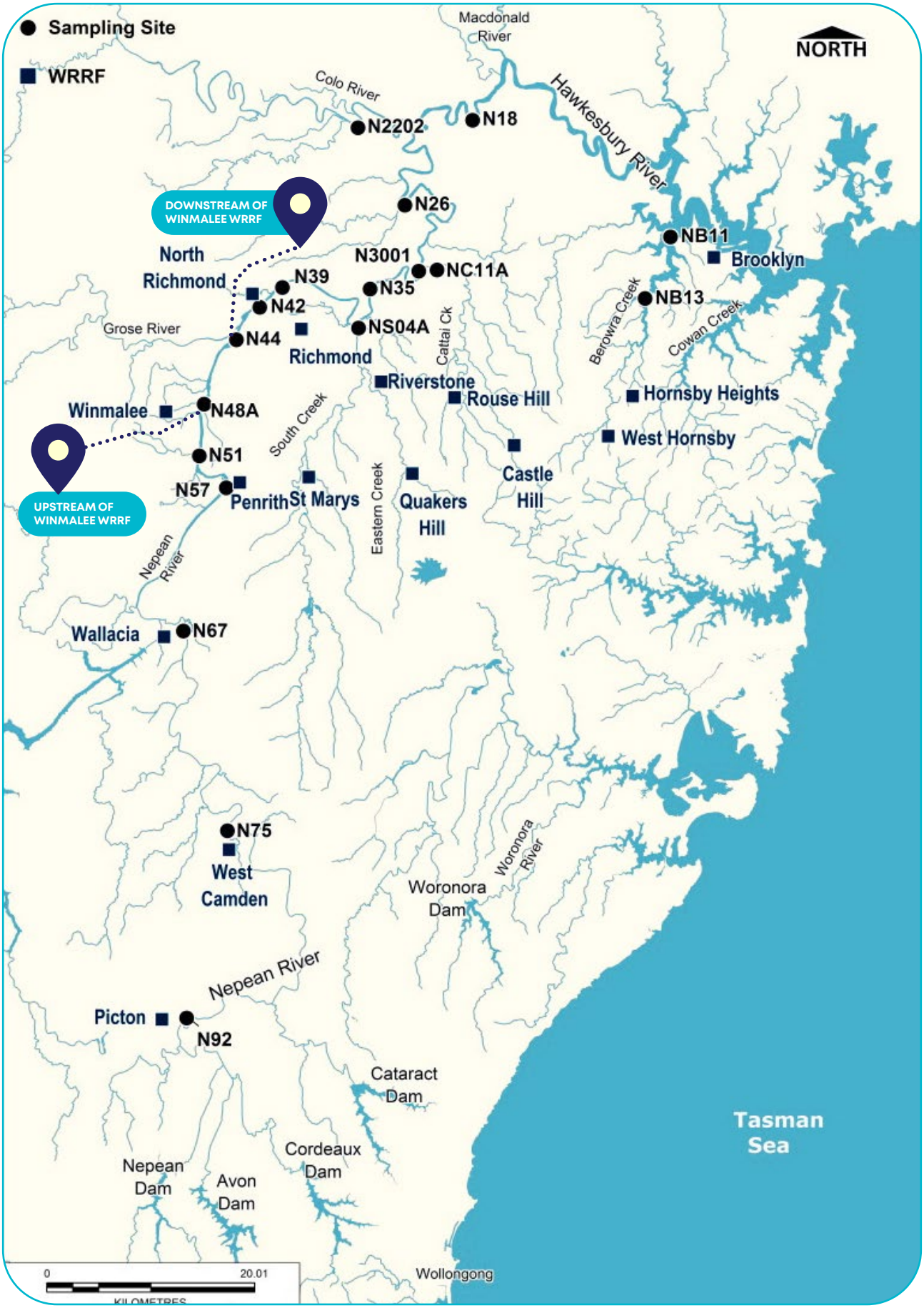
Stream health

Sydney Water monitors freshwater macroinvertebrate communities upstream and downstream of WRRF discharges to determine if stream health is altered by treated wastewater (Figure 3-10). A healthy stream is comprised of many different types of macroinvertebrate animals. A relatively persistent impact in stream health was also suggested by the SIGNAL-SG scores and multivariate testing of macroinvertebrate data from the unnamed creek which receives treated wastewater from Winmalee WRRF, but this impact did not extend to the Nepean River.

The types of macroinvertebrates present will vary according to natural factors such as stream type, altitude and geographic region. The types present will also vary according to human disturbance, particularly water pollution. Sydney Water has assessed ‘stream health’ with the Stream Invertebrate Grade Number Average Level (SIGNAL-SG) biotic index tool. ‘S’ indicates Sydney region version and ‘G’ indicates taxonomy is at the genus taxonomic level. This tool provides a sensitivity score for a macroinvertebrate sample and can range from 1 tolerant to 10 highly sensitive.

The 2021-22 monitoring results suggested localised ecosystem impacts in creeks downstream of West Camden WRRF, Winmalee WRRF, Hornsby Heights WRRF and West Hornsby WRRF. There was no evidence that these impacts had any effect on the Hawkesbury-Nepean River system to which these creeks flow.

FIGURE 3-10 WINMALEE STREAM HEALTH MONITORING SITES



3.8 Water and wastewater network discharges

We supply water and recycled water through over 23,500 of pipes,164 pumping stations and 260 reservoirs. Our wastewater network consists of over 26,639 km of pipes and 695 wastewater pumping stations. We control over 454 km of stormwater channels. Weather conditions present challenges in managing this extensive network. During heavy rain, stormwater enters the wastewater network through illegal connections and cracked pipes. Our network is designed with additional capacity to cope with higher flow during wet weather. However, if the combined wastewater and stormwater flow travelling through the network exceeds the capacity of the network, wastewater will be released to local waterways via designated emergency relief structures. This is called a wet weather overflow. These overflow points prevent wastewater from backing up into our customer's homes and businesses. During dry weather, due to dry soil conditions, tree roots seeking moisture enter through the pipes and cause blockages, which often result in dry weather overflows. Tree roots are the most common cause of blockages in the wastewater network. Inappropriate disposal of material into the network exacerbates these blockages as tree roots capture these solids. Inappropriately disposed items in our wastewater network include wipes, sanitary products, oil and grease and construction debris.

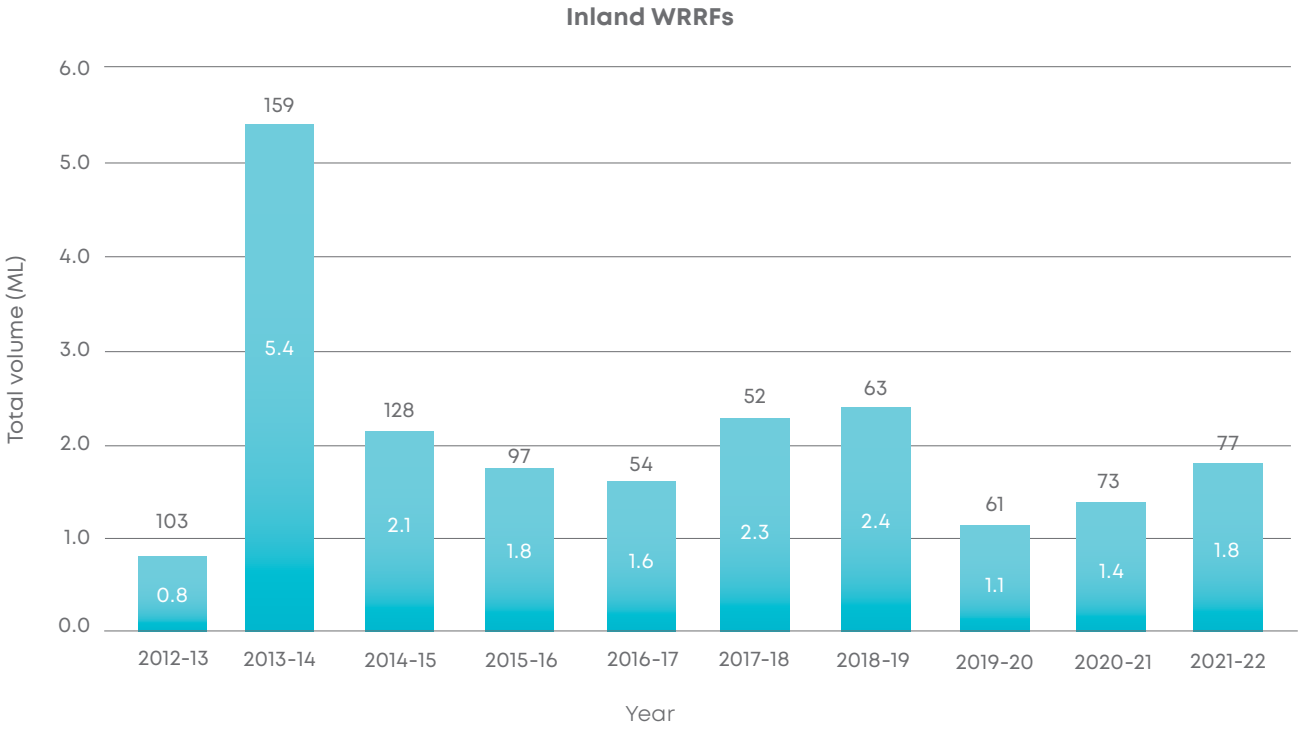
3.8.1 Dry weather overflows

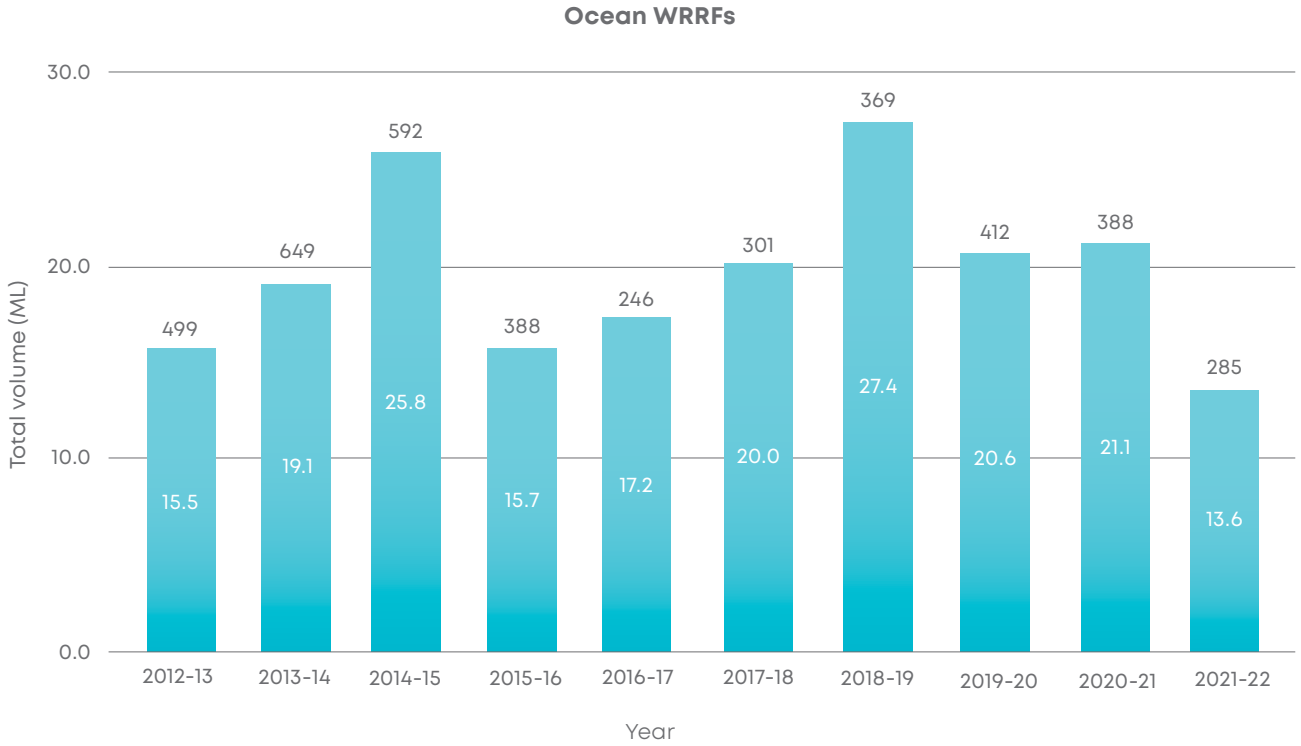
The most common cause for blockages in the wastewater network is tree roots. Pipe blockages due to structural faults are a small fraction of the total causes. Dry weather overflow volumes are measured when an incident is declared by Sydney Water. The total number of overflows, the estimated overflow volume and the proportion that reach a receiving waterway in each Sewer Catchment Area Management Plan (SCAMP) are reported to the EPA in our Annual Returns for each EPL. Each EPL has specified limits on the number of dry weather overflow incidents reaching waterways (Condition 7.4). Twelve systems have Condition L7.4 System Limits specified in their EPLs. Among these, six were under or equal to their limits in 2021-22 while the remaining six systems exceeded their EPL limit (compared to seven in 2020-21).

During 2021-22 eight ocean wastewater systems discharged 13.6ML of wastewater from network dry weather overflows, whilst 12 large inland wastewater systems discharged 1.8 ML of wastewater from network dry weather overflows (Figure 3-11). The total volume of wastewater from dry weather overflows in 2021-22 from our inland wastewater catchments increased by 30% compared to the previous year.

In 2021-22, Sydney Water experienced 11,070 blockages/chokes. Across all its wastewater networks, compared to 12,889 in 2020-21. The number of blockages/chokes has been reducing since 2018-19 mainly due to wet weather and increase in soil moisture. In 2021-22, 362 chokes and wastewater pumping station issues resulted in dry weather overflows reaching waterways, significantly less than 461 in the previous year.

FIGURE 3-11 PREVIOUS 10 YEARS OF DRY WEATHER OVERFLOW VOLUMES BY ALL OCEAN AND INLAND WASTEWATER SYSTEMS AND NUMBER OF INCIDENTS





Note: number of overflow events per year is shown at the top of each bar, volume (ML)

Most chokes are caused by blockages in small diameter pipes and result from a combination of factors. The most prevalent cause of blockages in small diameter pipes is tree roots. The internal diameter of most pipes is 150mm or 225mm. While tree roots are still the most prevalent cause of chokes, there is a continuing downward trend in these types of chokes. There are various other factors causing chokes as seen from Table 3-3. These other causes are difficult to predict as many are driven by customer behaviour such as flushing wet-wipes and disposing of fats, oils and grease from private properties.

TABLE 3-3 RELATIVE PERCENTAGE OF CHOKE CAUSES

Cause	Contribution	Description
Tree roots	45.1%	Tree roots entering through cracks, joints, and private sewers
Soft choke	20.6%	Combination of residual solids, non-flushable wipes, and sanitary products
Debris	15.4%	Debris from construction activity broken pipes and non-flushables
Fat / Grease	10.3%	Consolidated fat on pipe walls residential and commercial sources
Non-specific	3.5%	Includes Other, Unknown and Source Unknown and missing data
Structural	3.3%	Issues with the actual pipes such as collapses
Uncommon	1.8%	Several uncommon causes including some caused by customers

Key initiatives and improvement strategies for dry weather overflows

The key initiatives and improvement strategies that were undertaken in 2021-22 as scheduled investigations, works and activities to reduce the increased volume and frequencies of dry weather overflows are described below.

Preventive waterway program Level 1 (Maintenance hole inspections and CCTV)

This program includes condition assessment of pipes and maintenance structures likely to block and overflow to waterways (proactive program). Significant obstructions are cleared by jetting.

Our maintenance hole inspection program inspected 21,595 maintenance holes and associated sewer pipes. There is also a closed-circuit television (CCTV) Program for inspection of pipes after overflows reach waterways to minimise repeat occurrence from the same asset. We have completed over 21,500 Level 1 maintenance hole inspections with 843 km of Level 1 program and 2.6km of Level 2 Preventative waterway CCTV program. In addition, we have also completed 13.6km CCTV inspections after an overflow to waterways.

Lost flow analysis at pumping stations

These insights are used to identify abnormally low inflow rates compared to normal flow, which can indicate blockages upstream of the wastewater pumping station. In 2021-22 the analysis identified 39 potential blockages upstream of wastewater pumping stations that were then further investigated by field crews. Of the 39 potential chokes, 28 were confirmed as blockages that were identified and cleared before being reported by the public thereby reducing environmental impact.

Continuous lining

Overflows in bushland areas are not usually promptly identified and reported. They are often in areas that are difficult to access, which makes addressing the fault challenging and results in prolonged environmental impact. A continuous lining pilot project in Garigal National Park has proven methods for lining small diameter wastewater pipes (150mm-300mm) and associated maintenance structures that are most prone to tree root blockages.

In 2021-22, new continuous lining projects were initiated in bushland areas within the Cronulla and North Head wastewater systems. Planning work is underway, and lining works are expected to commence on the first projects in 2022-23.

Internet of Things (IoT)

IoT devices are now an important and permanent part of abatement activities. These are low-cost devices connected to the Internet-Of-Things (IoT) that monitor for sewage backing-up behind blockages such that the level of sewage in maintenance holes rises above normal. Nearly all the devices are simple float switches that are set-up to alarm when the level of sewage in a maintenance hole rises just above the top of the pipe. Downstream maintenance holes are also monitored so long as the surface level is below the upstream float switch. The length of pipe monitored downstream depends on local geography and the depth and grade of downstream sewers. In 2021-22, IoT devices detected 157 events where the sewer was found to hold wastewater due to a blockage and this was cleared without discharge to the environment. IoT devices found an additional 16 that had overflowed before crews could clear the blockage.

Artificial intelligence and defect detection in sewers

Sydney Water has 26,493 kilometres of wastewater pipes. We use cameras to take CCTV footage to find problems including tree root invasion and breaks in the pipes. It is important we address these defects in a timely manner as they can impact the environment. We have developed an artificial intelligence model (AI) that can process CCTV footage and has a high accuracy of detecting defects in our pipes. The AI model can categorise the type of defects and prioritise based on the severity. It provides an automated way to rapidly process and identify defects in hours of CCTV footage. It will help us to reduce repeated sewer blockages that inconvenience customers and mitigate environmental impact. Due to the success of this technology, we are looking to expand the application to use across our water and stormwater pipes.

Customer Campaigns

New Customer Products Standard – AS/NZS 5328:2022

Sydney Water's research identified community awareness of the wastewater system and the implications of wet wipes is low. It also revealed an estimated 1 in 4 people in Sydney are flushing wet wipes, and 72% of people who flush wet wipes are unsure or think they're biodegradable.

The added pressure on the system and the environmental, health and financial consequences of flushed wet wipes is unacceptable, and it is imperative this issue be addressed. For several years, Sydney Water has been active in trying to address the emerging issue of wastewater pipe blockages being caused by non-flushable wipes that are labelled or advertised as being flushable. We continue to work with the community, councils and media to promote the educational message to highlight what can safely be flushed and what is safe to put down sinks.

Sydney Water continues to work with its industry body, the Water Services Association of Australia, in representing the industry in the development of an agreed national and international Standard and tests for 'flushable' products which will better protect customer and utility wastewater pipes and help save the community millions of dollars a year. In May 2022, Standards Australia published the highly anticipated Flushable Products standard. The standard defines criteria for what material can be classified as 'flushable' and labelling requirements. The Standard is voluntary, however, for products to use a flushable symbol they must meet the requirements of the Standard. Sydney Water is actively helping educate consumers on products that meet this new standard.

Wet wipes can be found in about 75% of the blockages Sydney Water cleans every day. This has had dramatic consequences for the environment and public health, as the build-up of wet wipes causes blockages in the wastewater system and can cause overflows into local waterways and customer homes.

Flushable criteria (WSAA)

Flushable symbols

Wet wipes can be found in about 75% of the blockages Sydney Water cleans every day.

Wet wipes recovered from the system and the quantity indicated in a media campaign

3.8.2 Wet weather overflows

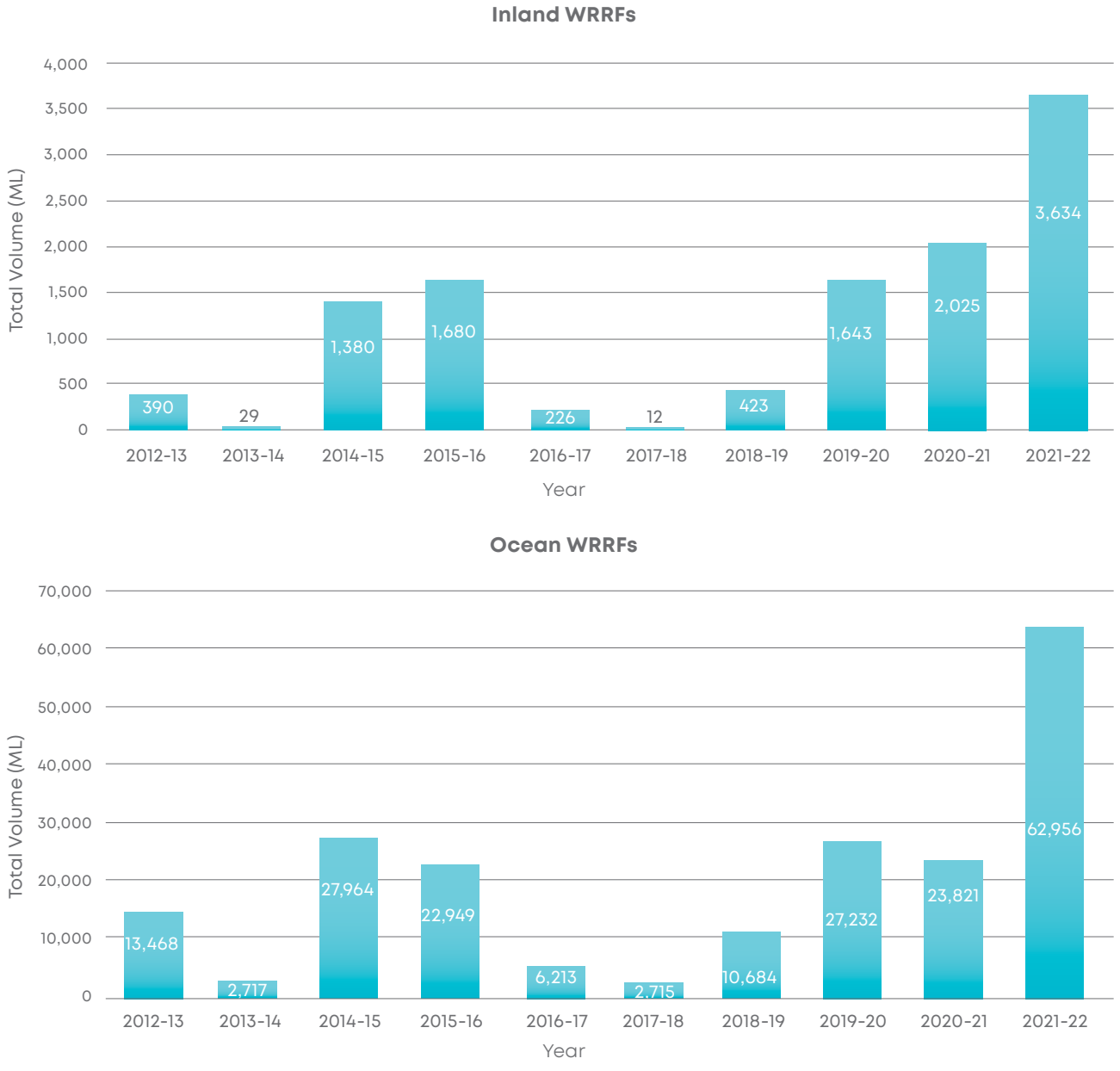
The 2021-22 reporting year was an extraordinarily wet year with very high rainfall recorded in both ocean and inland catchments. This resulted in an increase in wet weather overflow volumes by 164% compared to the 2020-21 year. The volume of wet weather overflows from the inland system increased by 79% compared to 2020-21.

Of the 23 wastewater system models two, Malabar and Shellharbour were assessed as non-complaint for EPL condition L7.1 about Hydraulic Sewer System Model. The frequency of wet weather overflows from seven wastewater systems exceeded the limits within EPL condition L7.2 i.e. maximum number of overflows per 10 years.

Thirteen systems complied with EPL conditions (L7.2, O4.8(c), O4.9 and O4.10). The complying systems were Bombo, Bondi, Castle Hill, Cronulla, Hornsby Heights, Penrith, Quakers Hill, North Head, Richmond, Wallacia, Warriewood, Winmalee and West Hornsby. Two systems (Picton and Brooklyn-Dangar Island systems) don't have conditions and hence were not assessed for EPL compliance conditions.

The non-compliances have been investigated and actions put in place to help identify and deliver works to bring systems back into compliance. Further details are provided in the report Sydney Water 2022b.

FIGURE 3-12 PREVIOUS 10 YEARS OF MODELLED WET WEATHER OVERFLOW VOLUMES BY ALL INLAND AND OCEAN WASTEWATER SYSTEMS



3.9 Stormwater network discharges

Stormwater assets help protect people and property from flooding, and form part of our urban waterways. Our stormwater network is a small (454 km), but critical part of the metropolitan drainage system, draining 15% of Sydney's urban area. Local councils own and maintain most of the city's stormwater assets. Poor quality stormwater is highly detrimental to waterway health and amenity.

Glenwood Reserve, Glenwood – detention basin used to control flooding and capture sediments.

In 2021-22 we removed silt and rubbish from over 75 stormwater quality improvement devices which prevented 1,659 m3 of debris (compared to 1,052 m3 in 2020-21) and 1,301 tonnes (compared to 1,288 tonnes in 2020-21) of sediment from entering Sydney's waterways. We also removed 1,221 tonnes of silt and debris from our stormwater channels in 2021-22. We also take the opportunity to improve waterway health and amenity by naturalising stormwater assets in suitable locations when they reach the end of their structural life.

Cooks River – Stormwater Quality Improvement Device

Naturalisation

We are progressively converting degraded concrete open channel stormwater assets to a semi-naturalised state, where the site conditions are suitable to enable this. This will be achieved by replacement of the channel with sloped sandstone banks with intermixed native plantings. This can help improve flooding outcomes, provide enhanced biodiversity and enable the creek line to become an asset that can be enjoyed by the local community. Projects include:

- **Muddy Creek Naturalisation Project** – Rockdale (1.6km creek bank) – Stage 1 completed and on-ground works began in October 2022. Project forecast for completion by 2024.
- **Johnstons Creek Naturalisation Project** – Glebe (1.2km creek bank) – Work was completed in October 2021 and has entered a two-year vegetation maintenance period.

Johnstons Creek, Annandale – Naturalisation

- **Whites Creek Naturalisation Project** – Annandale (300-metre creek bank) – Design work being undertaken. Delivery of this project is scheduled after 2025.
- **St Lukes Park Naturalisation Project** – Canada Bay (1.4km creek bank) – Detailed design work being undertaken. Delivery of this project is scheduled after 2025.
- **Iron Cove Creek Naturalisation Project** – Haberfield (600-metre creek bank) – Iron Cove Creek draft scope of services with Technical Specification document currently being produced by Sydney Water. Project forecast for completion by 2024.

04 Efficient and sustainable resource and reuse

We recognise the critical value of water as a precious resource. We are developing a diverse and adaptive baseline water conservation program that has the capability to deliver the water saving aspirations identified in the Greater Sydney Water Strategy (GSWS), and scale efforts in times of drought. Initiatives that fall under the program are designed to be economically viable and environmentally sustainable without compromising the value provided to customers and the community.

4.1 Develop and implement water conservation program

Water conservation through water efficiency, leakage reduction and recycled water use is not only key to creating and contributing to thriving, liveable and sustainable cities, it also helps investment in new water sources by reducing the demand for drinking water for non-drinking purposes. Our approach to water conservation is based on delivering the following outcomes:

- Sustainable and efficient management of our resources
- Developing water resilient and water smart communities
- Enabling liveability outcomes for the community.

We place a high priority on water conservation as part of a range of measures to ensure a resilient and secure water supply for Greater Sydney. In 2021-22, water conservation program had six key focus areas.

WATER CONSERVATION – SIX KEY FOCUS AREAS

The water conservation activities during 2021-22 achieved total water efficiency of 742 ML in annual savings. Leakage-management programs have ensured that Sydney Water manages drinking water supply efficiently, minimising water loss from our assets and potentially delaying investment in new large-scale supply infrastructure. Water leakage in 2021-22 was estimated at 121.5 ML/d, an increase compared with 2020-21 (112.5 ML/d) despite a continued focus on our leakage program. However, it is within the range of the Economic Level of Leakage (ELL) band of 108 ± 16ML/d. The ELL is used to measure Sydney Water's performance and determine proactive leak-reduction activities which are cost effective. Our analysis to date indicates that the increase may be due to the ongoing wet weather during 2021-22, resulting in:

- Soil saturation causing increased pipe movement and potential cracks / breaks
- Reduced visibility of leaks meaning less leaks are reported by customers
- Reduced ability to detect hidden leaks
- Impact on detection and repair work to ensure the safety of our people during adverse weather events.

In 2021-22, the total length of mains inspected for leaks increased (15,455 kms compared to 12,000 kms in 2020-21) under the active leak detection program. We are working on identifying target areas to improve the effectiveness of the program. Existing recycled water schemes helped produce 37.7 GL of recycled water, contributing to a reduction in drinking water demand of 12.7 GL. Key highlights from 2021-22 include various Waterfix® programs, the launch of 2022 Water Efficiency Grants and Pool Cover Rebate Pilot Program in April 2022.

Research and innovation programs are designed to increase water savings and reduce drinking water demand. We continue to become water-wise and save water. We have implemented a series of programs including Active Leak Detection, and Leak Detection Canine Program that detect leaks in our environment. Sydney Water is currently piloting several options to understand which of the multiple emerging technologies are the most appropriate for water leaks and therefore water conservation. Refer to Water Conservation report for more details.

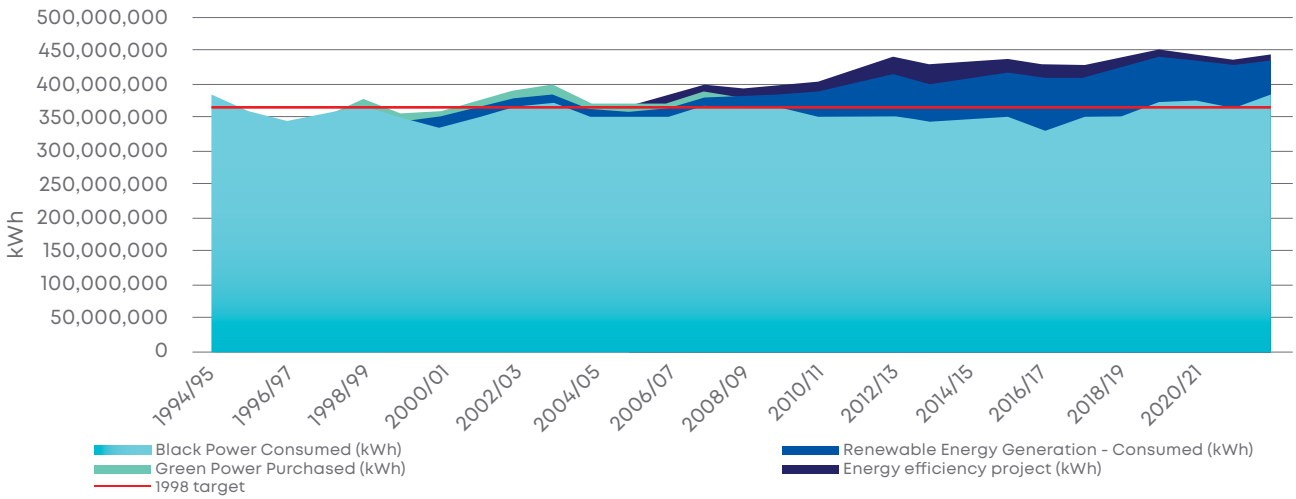
4.2 Maintain our grid-sourced electricity demand below 1998 levels

Sydney Water's goal is to achieve grid electricity consumption equivalent to 1998 levels (366 GWh). In 2021-22, we consumed 386 GWh, therefore our consumption was above the internal benchmark by 19 GWh.

The increase in grid electricity consumption is due to the following factors:

- Significant wet weather throughout 2021-22. Rainfall totals for Greater Sydney were as much as double the long-term average, and 2022 was the wettest year on record. This impacted renewable energy generation across all sites in Sydney Water, with greater operational challenges than experienced in 2020-21 and a consequent increase on the reliance on grid electricity consumption to operate Sydney Water facilities.
- A greater amount of electricity was required to operate Sydney Water's wastewater pumping stations, which experienced significant inundation and extended pump run-times. WRRFs also experienced a significant increase in electricity consumption due higher inflow volumes.
- The expected wind-down of the Sydney Desalination Plant (SDP) operations in 2021-22 did not occur due to multiple poor raw water quality events necessitating the continuous operation of the plant. The SDP reached full production mode multiple times during the reporting period and was otherwise on low production / standby mode.

FIGURE 4-1 ENERGY USAGE BY SOURCE (INCLUDING ENERGY EFFICIENCY PROJECTS)



* Assuming energy efficiency projects have an average of life cycle for 7 years

Fuel usage from Sydney Water increased due to easing COVID-19 restrictions and resuming of maintenance activities. Additionally, the prolonged wet weather and flood events had significant impacts on Sydney Water's assets, which have required considerable reactive works.

Gas consumption decreased in 2021-22 as consumption at the West Ryde Laboratories significantly reduced from September 2021 to April 2022. The existing gas hot water units were inefficient in the summer months and consuming excess amounts of gas. The gas units were upgraded, and now perform much more efficiently in the summer months compared to previous years. Winter consumption stayed consistent.

Sydney Water's on-site renewable energy generation (53,012,098 kWh) was equivalent to 12.2% of total energy consumption in 2021-22. Renewable generation was 10% lower than the previous two years. This is attributable to several factors including:

- Reduced renewable energy production due to reduced capture at ocean treatment plants during wet weather.
- Malabar Cogen units being taken offline resulting in reduced overall production,
- Prospect Hydro remained offline due to pipeline maintenance,
- North Head hydro upgrade extended due to wet weather.

4.3 Bioresources

While providing water, wastewater, recycled water and storm water services to our customers, we inevitably generate a range of byproducts that have some beneficial value. While some products are unlikely to have value (such as wipes and other sewage litter), others do have product value (with adequate treatment, sorting or processing). These 'bioresources' are collected at various stages of the process – during transport and treatment of water, wastewater or stormwater. Sydney Water's biosolids are an excellent example of how the end product of our wastewater treatment can be recovered and reused as a valuable resource in the agricultural and forestry industries. Biosolids are the nutrient-rich organic material produced from wastewater treated at our WRRFs.

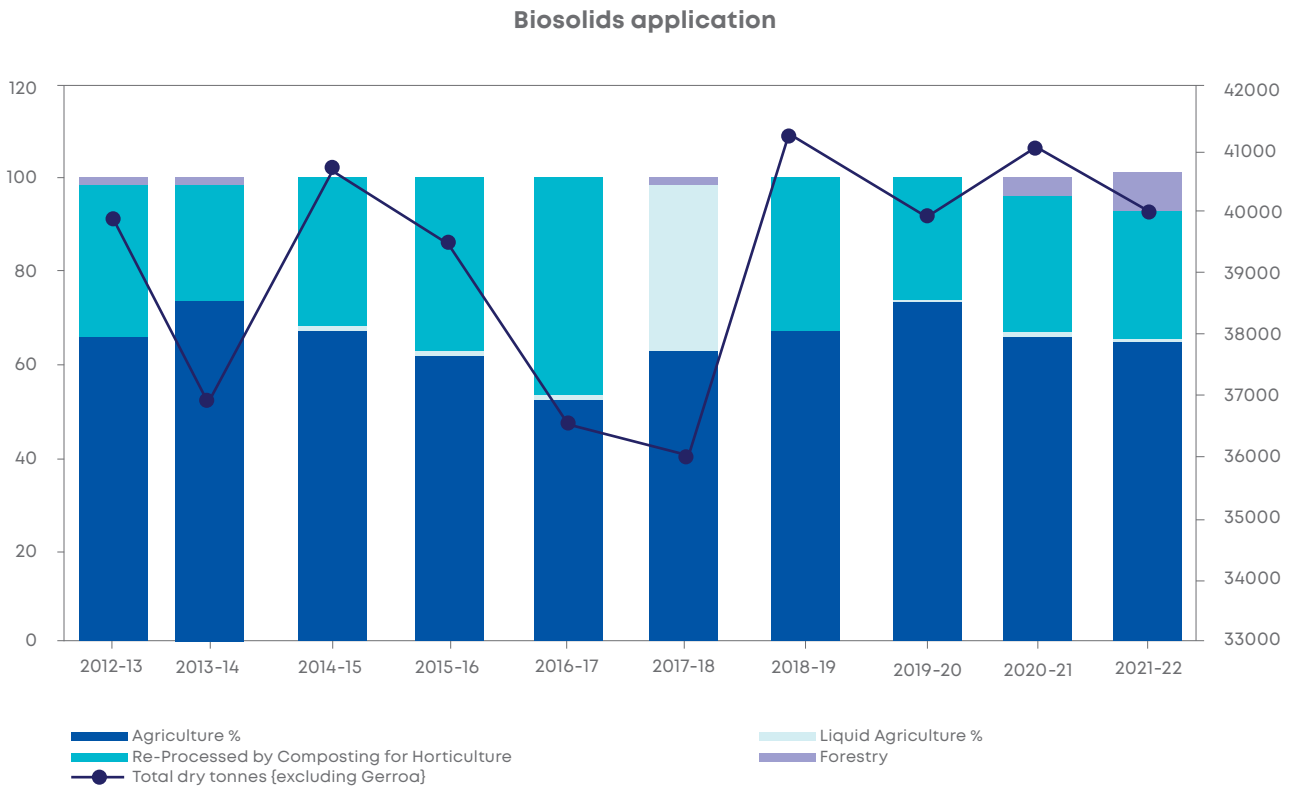
We have been consistently achieving 100% beneficial use of biosolids for agricultural and horticultural purposes. 2021-22 saw Sydney Water beneficially reuse 40,241 dry tonnes of biosolids, with 65% being sent direct to agricultural land application, 28% reprocessed through compost markets and 8% directed to application in forestry (Figure 4-2). Changes to how Sydney Water operates treatment plants, and introduction of new technology can have an impact on the quality of our biosolids. Sydney Water is also investigating the carbon impacts and benefits that these products are having on different markets We have completed a Carbon study, which identified that applying biosolids to new sustainable forestry, or applying biosolids that were converted to biochar, both resulted in positive soil carbon sequestration benefits. However, our current biosolids management practices do have carbon emissions. Further investigation is required to look at the whole of life, production and end use of biosolids products before changing our current practices.

The success of the biosolids program has driven Sydney Water to examine other end products from our processes with the view to expand our recovery products. For example, over the past 12 months we have started programs that examine meaningful recovery pathways for grit that's removed from our WRRFs and wastewater networks. The Grit project is currently at an analysis stage. Sydney Water is looking at the best available pathways to move these products from landfill to a resource recovery market (Table 4-1) despite a resource recovery exemption not established as yet.

TABLE 4-1 BIORESOURCES REUSED

Source	Description
Wastewater	Biosolids
Water	Water treatment sludges
Land Management	Vegetation (pruning, clearing, riparian zones) Construction spoil Drilling mud

FIGURE 4-2 BIOSOLIDS PRODUCED AND PERCENT USAGE



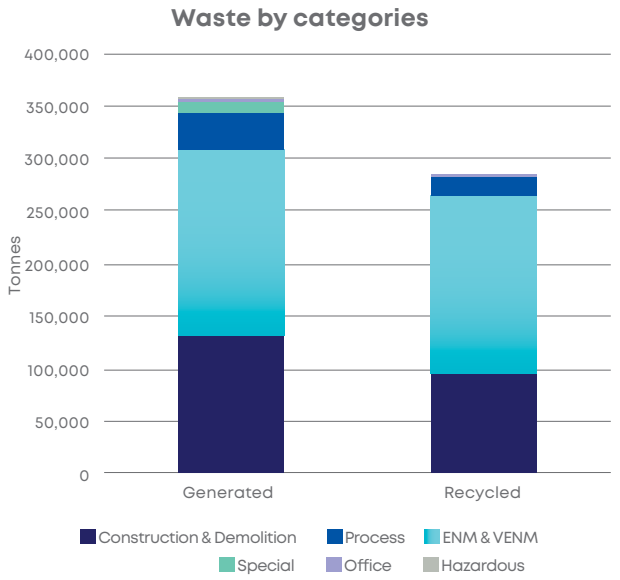
Biosolids garden at Penrith Water Resource Recovery Facility

4.4 Waste

In 2021-22, Sydney Water generated 355,973 tonnes of solid waste, an increase of 48% from 2020-21 (see Figure 4-3), with 80% of this waste reused onsite, offsite or sent for recycling. **The overall recycling rate for 2021-22 increased to 80%, compared to 61% in 2020-21.**

Sydney Water generates waste across two sectors. Commercial and industrial waste is generated by our operations and includes waste from water and WRRFs. It also includes waste generated from maintenance programs and waste from our offices. We also generate significant waste from our major project works, and maintenance works. Our construction and demolition activities were responsible for 90% (319,984 tonnes) of the total waste generated and were the major contributor to the overall generation of waste in 2021-22. Of the waste generated from our construction and demolition activities, 83% (264,568 tonnes) was recycled or reused. This significant increase is attributable to 55% of construction and demolition waste being virgin excavated natural material (VENM) and excavated natural material (ENM).

FIGURE 4-3 WASTE GENERATED IN 2021-22 BY CATEGORIES



As shown in Figure 4-3, special waste (asbestos-contaminated waste) amounted to 11,153 tonnes, whilst 22 tonnes were classified as hazardous waste. Of the total amount of waste generated, about half (177,351 tonnes) was virgin excavated natural material (VENM) and excavated natural material (ENM). Over 95% of this material was recycled or reused. Most of this material was generated from our major project works.

FIGURE 4-4 FIVE-YEAR TRENDS PERCENTAGE WASTE RECYCLED BY CATEGORIES

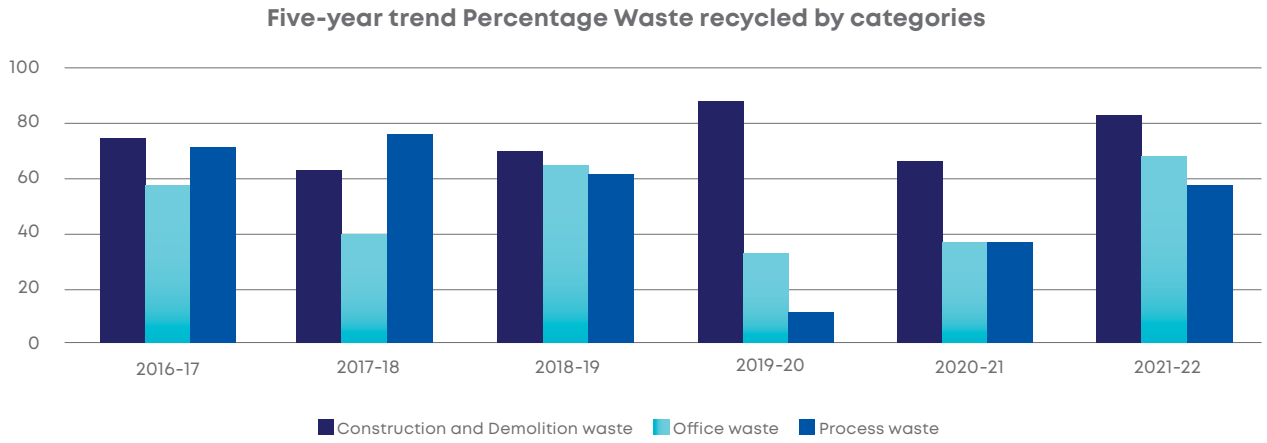


Figure 4-4 Waste recycling has increased since 2019-20, reaching 285,687 tonnes in 2021-22. The increase across three categories, construction and demolition being the major contributor to waste recycling in the three categories. The upward trend in recycling indicates Sydney Water's commitment to reducing the quantity of waste sent to landfill.

05 Community involvement

5.1 Community Involvement projects

Sydney Water engages with the community through various project-based initiatives including educational programs. Since May 2022, our Community Education Team has engaged with nearly 2,000 children and adults through the Wonders of Water Discovery Van. This mobile education vehicle helps us educate our community on the water cycle and the circular economy, including how water is captured, treated and distributed.

5.1.1 Water stations

We continue to help protect our waterways and the environment from plastic bottle waste. Every refill at our water stations reduces the number of plastic bottles in circulation. We have 160 public water stations with messaging to encourage people to drink tap water. The message is translated into 11 languages for councils across Greater Sydney, the Blue Mountains and Illawarra region with diverse residents, including Chinese, Korean, Arabic, Vietnamese, Dhari, Hindi, Khmer, Assyrian, Nepali, Japanese and Filipino. These water stations recorded consumption of more than one million litres in 2021-22. This accounts for more than 5.6 million litres of drinking water over the past three years. More than 500 events were supported with our fleet of 50 portable water stations to councils and community events. The program is well and truly back up and running after previous COVID-related shutdowns and event cancellations.

5.1.2 Water efficiency campaign

We are engaging with the community through our media and public relations campaigns. As mentioned earlier, conservationist Shane Jacobson led our 'Turn it off Bob' campaign, increasing awareness of day-to-day water usage in and around people's homes. To measure its success in engaging with the community, Sydney Water's Brand Tracker showed that 71% of the 3,260 people surveyed will reduce water use outside the home, 50% intend to use less water in the bathroom and 43% said they would use less water in the kitchen. In addition, a public relations campaign promoted relevant water-saving tips, highlighting Sydney Water's initiatives to ensure reliability of supply and further reinforce-water saving measures.

Campaign characters

5.1.3 Wastewater campaign

We are also engaging with the community by harnessing traditional and digital media to drive behavioral change, educate the public, engage and empower our customers. The 'Are You Flushing Kidding Me?' and 'Best to Bin It' campaigns were rolled out to highlight what is safe to flush and put down sinks. Research has highlighted a lack of awareness from customers about what can safely and responsibly be flushed, 3Ps – pee, poo and (toilet) paper – and put into sinks.

Results from the 'Are you flushing kidding me' campaign showed:

- 89% of the population put potential blockers down the sink at least occasionally,
- 40% of people think it is okay to flush tissues down the toilet and
- 4% are under the impression that all types of non-flushable wipes can be flushed, not just those which meet the new 'flushability' Australian standard.

Items such as non-flushable wipes create blockages and are a significant issue for our wastewater network. Over 2021-22, Sydney Water dealt with more than 11,000 blockages, costing $10.6 million to repair.

The consequences of not disposing of bathroom waste correctly, combined with putting inappropriate items down the sink, costs customers money and harms the environment. Results from the related 'Best to Bin It' campaign showed:

- 75% of consumers would consider putting only the 3Ps down the toilet and binning everything else,
- 57% of consumers intend to learn more about what they can and cannot put down the toilet and 59% of consumers intend to learn more about what they can and cannot put down the sink, and
- 45% of consumers would consider sharing the advertisement within their social network.

In May 2022, Standards Australia released a 'flushability' standard, and Sydney Water is actively helping educate consumers on products that meet this new standard.

5.2 Customer satisfaction, awareness, and behaviour

We know that the work we do impacts our customers and the community in different ways. Good community and stakeholder engagement allows us to explain proposals and build water literacy. It also gives us the opportunity to share their knowledge, issues and support programs. In addition, we can understand and respond to community and stakeholder views. The below two tools are used to monitor community engagement activities.

5.2.1 Brand Tracker

Sydney Water's Brand Tracker continues as an effective measuring tool to measure community engagement and sentiment. Officially launched in quarter one of 2021-22, it measures customer satisfaction, awareness, reputation, price perception and behaviour. These are all collectively termed 'customer advocacy'. The customer categories measured in the customer advocacy metric includes residential customers and businesses.

TABLE 5-1 STAKEHOLDER PERCEPTIONS SURVEY 2022 OVERVIEW

Customer trusts that Sydney Water	Response FY 2021-22			
	Q1	Q2	Q3	Q4
is making it easy to be smart with their water and look after the environment • Waterwise	49%	49%	50%	48%
to always protect the environment. • Environmentally focused	61%	60%	62%	59%
is environmentally sustainable organisation • Sustainability	59%	57%	59%	56%

5.2.2 Community Sentiment Monitor

This survey provides a snapshot of what is working well and the challenges and opportunities. One of the findings of the tool is that customers are becoming aware that it is NOT okay to flush tissues, however, a downward trend was seen Table 5-2 in response for the question 'Okay to flush anything beyond human waste and toilet paper'.

TABLE 5-2 COMMUNITY SENTIMENT MONITOR 2022 OVERVIEW

Most important issues	Response FY 2021-22			
	Q1	Q2	Q3	Q4
Best to Bin It campaign	55%	56%	54%	58%

Environment (climate change, sustainability, etc.) was shown as significantly higher concern among university graduates.

06

References

Sydney Water, October 2022, Annual Report,

ANZECC, 2000. Australian and New Zealand Water Quality Guidelines for Fresh and Marine Waters, Australian and New Zealand Environment and Conservation Council.

ANZG 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia. https://www.waterquality.gov.au/anz-guidelines

Dry Weather Sewage Overflow Audit Report Independent Review, March 2019

BeachWatch program (DPIE). https://www.environment.nsw.gov.au/research-and-publications/publications-search/state-of-the-beaches-2021-22

Manning, S., Dixon, J., Birch, G.F. and Besley, C.H. 2019. Deepwater ocean outfalls: a sustainable solution for sewage discharge for mega-coastal cities (Sydney, Australia): Influences on beach water quality. Marine Pollution Bulletin, 145, pp. 691-706.

Sydney Water, 2022, STSIMP Data Report, 2022 Sewage Treatment System Impact Monitoring Program, Volume 1 Data Report 2021-22, SW 65 12/21, Sydney Water, December 2022.

Sydney Water, 2022a Dry Weather. Sewage Treatment System Licences, Annual System Performance Report Clause R5.5 b) and c), Reticulation System, Dry Weather Sydney Water, September 2021.

Sydney Water, 2022b Wet Weather. Sewage Treatment System Licence, Annual Sewage Treatment System Performance Report – Wet Weather Overflow, 2021–22, Sydney Water, September 2022.

07

Appendices

Appendix A: Environmental Indicators Performance Report 2021-22

(Submitted to the IPART
1 October 2022)

Contents

Executive summary

At Sydney Water, caring for and protecting our environment is a core value of everything we do.

Sydney Water is governed by the *Sydney Water Act 1994* (the Act). The Act and our Operating Licence require us to report each year on indicators of the direct impact our activities have on the environment.

The Environment Performance Indicators Report 2021-22 details our performance against the environmental indicators required to be reported to the Independent Pricing and Regulatory Tribunal (IPART) in accordance with clause 8.1 of the Operating Licence Reporting Manual (April 2022). These include:

- 10 environmental indicators set by IPART
- 15 National Water Initiative (NWI) indicators relating to the environment, from the *National urban water utility performance reporting framework* (National urban water utility performance reporting framework: Indicators and definitions handbook, January 2018)

The NWI indicators are part of the National Urban Water Utility Performance Reporting Framework. The NWI is a shared commitment by Australian State and Federal Governments to improve water resource management and use water resources more efficiently. Data from all Australian water utilities is collated annually and published in a National Performance Report prepared by the Bureau of Meteorology (BoM). The report provides a national comparative 'report card' that enables consumers and governments to assess how well water utilities are performing.

Sydney Water's performance against the environmental indicators has been stable and improving for some indicators, despite the challenges we have faced with heavy rainfall and COVID-19 over 2021-22. Key points include:

- An increase in total wastewater flows received and treated by wastewater treatment plants due to population growth, but predominantly due to significant La Niña wet weather events.
- A decrease in uncontrolled dry weather wastewater overflows partly attributable to improvements through Sydney Water's Environmental Improvement Program (EIP) and favourable climate and weather conditions.
- Gross greenhouse gas emissions were consistent with historical performance.
- Electricity consumption increased moderately compared to 2020-21 and subsequent historical figures. This is mainly attributable to wet weather as a greater amount of energy is required to operate wastewater pumping stations.
- Sydney Water's goal is to achieve grid electricity consumption equivalent to 1998 levels (367 GWh), 2021-22 consumption did not meet this benchmark by 19 GWh due to increased energy consumption and lower renewable energy production.
- Renewable energy generation was slightly lower than previous years. Significant rainfall reduced the efficiency of renewable energy generation due to operational limitations and maintenance issues.
- 100% of biosolids was beneficially used.
- Sydney Water generated 356,030 tonnes of waste, an increase of 48% from 2020-21 due to an increase in construction projects
- The overall recycling rate for 2021-22 increased to 80%, compared to 61% in 2020-21 as a significant proportion of the waste generated was virgin excavated natural material and excavated natural material which was recycled.
- In 2021–22, there was a net loss of native vegetation, with a total of 7.83 ha of native vegetation cleared.

Sydney Water will continue to improve our environmental performance and resilience, so that we can create a better life with world-class water services.

1 Our environment indicators

TABLE 1 LIST OF THE ENVIRONMENT INDICATORS

Category	Indicator
Wastewater treatment and system discharges	**NWI IE1** Volume of wastewater treated to a primary level (ML)
	NWI E1 Percentage of wastewater treated to a primary level (%)
	NWI IE2 Volume of wastewater treated to a secondary level (ML)
	NWI E2 Percentage of wastewater treated to a secondary level (%)
	NWI IE3 Volume of wastewater treated to a tertiary level (ML)
	NWI E3 Percentage of wastewater treated to a tertiary or advanced level (%)
	IPART E3 Total number of controlled wastewater overflows that occur in dry weather that are discharged to the environment, per km of sewer main
	IPART E4 Total number of uncontrolled wastewater overflows that occur in dry weather that are discharged to the environment, per km of sewer main
Greenhouse gas emissions	**NWI IE9** Net greenhouse gas emissions: water supply (tonnes CO2 equivalents)
	NWI E9 Net greenhouse gas emissions per 1,000 properties: water supply (tonnes CO2 equivalents per 1,000 properties)
	NWI IE10 Net greenhouse gas emissions: wastewater (tonnes CO2 equivalents)
	NWI E10 Net greenhouse gas emissions per 1,000 properties: wastewater (tonnes CO2 equivalents per 1,000 properties)
	NWI IE11 Net greenhouse gas emissions: other (tonnes CO2 equivalents)
	NWI E11 Net greenhouse gas emissions per 1,000 properties: other (tonnes CO2 equivalents per 1,000 properties)
	NWI IE12 Total net greenhouse gas emissions (tonnes CO2 equivalents)
	NWI E12 Total net greenhouse gas emissions per 1,000 properties (tonnes CO2 equivalents per 1,000 properties)
Energy	**IPART E1** Total energy consumption by the water utility (electricity, fuel and gas) in units provided on energy bills
	IPART E2 Electricity consumption from renewable sources or generated by the water utility expressed as a total percentage of electricity consumption
Biosolids	**IPART E5** Estimated total mass of biosolids produced by the water utility
	NWI E8 Percentage of biosolids reused (%)
Waste	**IPART E6** Percentage of solid waste recycled or reused expressed as a percentage of solid waste generated
	IPART E7 Estimated total mass of solid waste generated by the water utility
Native Vegetation	**IPART E8** Total area of clearing of native vegetation
	IPART E9 Total area of native vegetation rehabilitated, including due to replanting, weeding and protection by the water utility
	IPART E10 Total area of native vegetation gain due to rehabilitation, replanting, weeding and protection by the water utility

2 Wastewater treatment and system discharges

Indicator	2017-18	2018-19	2019-20	2020-21	2021-22
NWI IE1 Volume of wastewater treated to a primary level (ML)	315,657	341,249	338,884	343,986	388,757
NWI E1 Percentage of wastewater treated to a primary level	68%	68%	67%	63%	62%
NWI IE2 Volume of wastewater treated to a secondary level (ML)	34,858	44,788	42,255	60,173	76,803
NWI E2 Percentage of wastewater treated to a secondary level	8%	9%	8%	11%	12%
NWI IE3 Volume of wastewater treated to a tertiary level (ML)	104,156	116,728	121,266	137,845	163,063
NWI E3 Percentage of wastewater treated to a tertiary or advanced level	23%	23%	24%	25%	26%
IPART E3 – Total number of controlled wastewater overflows that occur in dry weather that discharged to the environment, per km of sewer main	0.002*	0.002*	0.002*	0.001*	0.001
IPART E4 – Total number of uncontrolled wastewater overflows that occur in dry weather that discharged to the environment, per km of sewer main	0.014*	0.021*	0.035*	0.031*	0.022

Note: * indicates historical data updated in line with changed reporting method. Further explanation provided in section 2.2.

2.1 Volume of treated wastewater

There was an increase in total wastewater flows received and treated by the wastewater treatment plants in 2021-22, related in part to population growth, but predominantly due to significant La Niña wet weather events. Changes in the proportions of flows receiving different levels of treatment have resulted from:

- reduced transient population movements in business districts related to COVID lockdowns and changing work patterns
- development in growth catchments
- rainfall distribution across the catchments

2.2 Number of wastewater overflows/ system discharge

In 2021-22, Sydney Water operated 26,639 km of wastewater main network. There were:

- 36 controlled dry weather network overflows (from designated – designed overflow structures); and
- 582 uncontrolled dry weather network overflows.

Dry weather wastewater overflows are generally caused when pipes are blocked by foreign matter (tree roots, fats and grease, non-flushable wipes, etc) or pipes collapse downstream of either a designed overflow structure or other outlet resulting in an uncontrolled discharge to the environment. Based on the results derived from the new IPART E3 and IPART E4 indicator interpretation, in 2021-22, the total number of uncontrolled wastewater overflows during dry weather has decreased (from 834 in 2020-21), partly attributable to improvements through Sydney Water's Environmental Improvement Program (EIP) and favourable climate and weather conditions. The number of controlled overflows has remained similar to the revised figures in 2020-21 period (34 controlled overflows in 2020-21). IPART E3 and IPART E4 figures were revised as we reviewed our interpretation of these indicators. Previously the number included overflows reaching waterways only. The new figures include controlled (IPART E3) and uncontrolled (IPART E4) wastewater overflows, occurring in dry weather, that have caused potential or actual harm to the environment.

With more urbanisation and population growth, the pressure on our wastewater network and waterways increases. Sydney Water is focused on minimising the occurrence of chokes (blockages) in the wastewater system and the risk to the environment from wastewater overflows through a consolidated maintenance hole inspection and choke management program. A key component of the overall strategy is a program of works involving inspections and repairs of assets with repeat failures or assets that could impact waterways if an overflow occurs. Sydney Water has also improved its performance in field response to chokes through process and equipment changes to minimise the volume of wastewater overflow reaching a waterway.

Internet of Things (IoT) technology is a key enabler for a hyper-connected utility, providing Sydney Water with near-real time asset performance analytics leading to better asset performance and customer outcomes. We supplemented our existing IoT devices with an additional 3000 devices in 2021-22. Through an extension of the program, we will further bolster our fleet of now 6000 IoT devices in 2022-23.

Our environmental performance is reported to the NSW Environment Protection Authority (EPA) every year. To know more about Sydney Water's sewage treatment system licences issued by the EPA, please see the EPA website and the public register at www.epa.nsw.gov.au.

3 Greenhouse gas emissions

Indicator[4]	2017-18	2018-19	2019-20	2020-21[5]	2021-22
NWI IE9 Net greenhouse gas emissions: water supply (tonnes CO_2 equivalents)	132,411	125,626	119,083	119,145	110,951
NWI E9 Net greenhouse gas emissions per 1,000 properties – water supply (tonnes CO_2 equivalents per 1,000 properties)	67	62	58	57	54
NWI IE10 Net greenhouse gas emissions: wastewater (tonnes CO_2 equivalents)	189,206	217,892	218,569	191,347	216,893
NWI E10 Net greenhouse gas emissions per 1,000 properties: wastewater (tonnes CO_2 equivalents per 1,000 properties)	98	111	109	94	107
NWI IE11 Net greenhouse gas emissions: other (tonnes CO_2 equivalents)[6]	20,764	21,239	20,886	25,278	25,556
NWI E11 Net greenhouse gas emissions per 1,000 properties: other (tonnes CO2 equivalents per 1,000 properties)[7]	10	11	10	12	12
NWI E12 Total net greenhouse gas emissions (tonnes CO_2 equivalents)	342,381	359,074	358,537	335,770	353,400
NWI E12 Total net greenhouse gas emissions per 1,000 properties (tonnes CO_2 equivalents per 1,000 properties)[8]	173	178	175	161	171

4 Data excludes the Sydney Desalination Plant. It continues to offset 100% of its electricity consumption with renewable energy. Scope 3 emissions are excluded. Scope 3 emissions are defined in the Greenhouse Gas Protocol, www.ghgprotocol.org. For the purposes of this submission, BOOT plants and Contractor emissions are included as Scope 1 and 2 emissions as appropriate.

5 Data for E9, E10, E11 and E12 indicators for the previous financial year are updated after the National Greenhouse and Energy Reporting (NGER) audit on 31 October 2021. The total greenhouse gas emissions for 2020-21 reduced by approximately 17,000 tonnes of CO_2–e due to revised fugitive emissions totals.

6 Includes the surrender of NSW Greenhouse Gas Abatement Certificates (NGACs) to offset greenhouse gas emissions. No NGACs have been surrendered for the past 5 years, however the option is available to Sydney Water and this is where those surrendered certificates would be captured.

7 Includes recycled water use.

8 Total net emissions do not equal the sum of NWI E9, NWI E10 and NWI E11 as the numbers of properties with water and wastewater services differ. NWI E10 is calculated using the number of properties supplied with wastewater services. NWI E9, E11 and E12 are calculated using the number of properties supplied with water services.

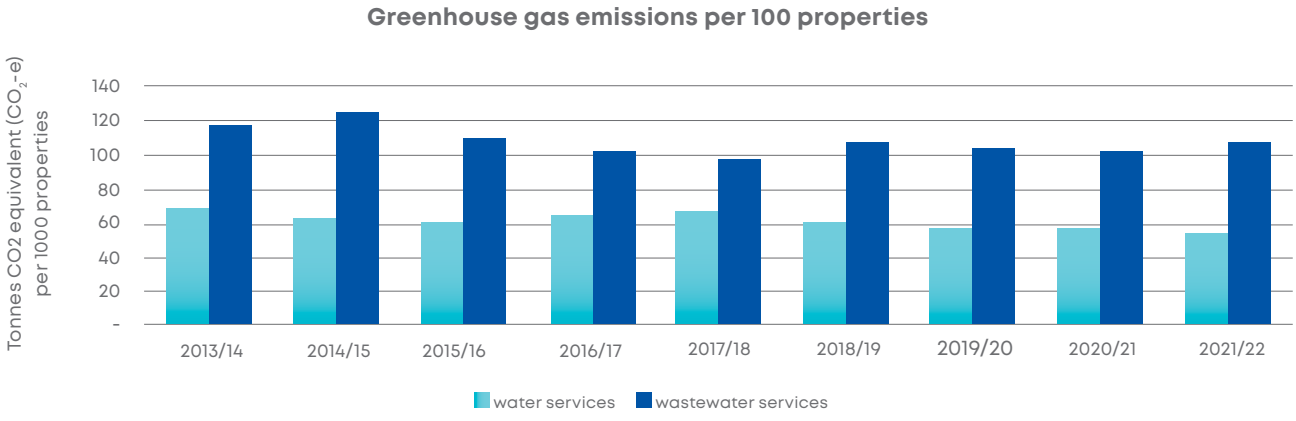
Sydney Water's operational greenhouse gas emissions

Sydney Water reports its greenhouse gas emissions (that is, the equivalent carbon dioxide (CO_2–e) emissions) by measuring its electricity, fuel and gas consumption and fugitive gas emissions (NWI E9 and E10). Emissions reported in NWI E11 include emissions from corporate overheads and the surrender of carbon offsets.

In 2021-22, our gross greenhouse gas emissions were 353,603 tonnes CO_2–e (tCO_2-e), which is consistent with recent historical reporting periods. Factors affecting the emissions total in 2021-22 include:

- Significant wet weather throughout 2021-22. Rainfall totals for Greater Sydney across this timeframe were as much as double the long-term average, and 2022 to-date is the wettest year on record. This impacted renewable energy generation across all sites in Sydney Water, with greater operating difficulties than experienced in 2020-21. This subsequently increased the reliance on grid electricity consumption to operate Sydney Water facilities. A greater amount of electricity was required to operate Sydney Water's wastewater pumping stations, which experienced significant inundation of wastewater and extended pump run-times. Treatment facilities also experienced significant electricity consumption due to the higher incoming wastewater volume.
- Lower emissions for water consumption offset this increase (greater wet weather led to lower water consumption across Sydney, due to decreased need for outdoor use, and greater opportunities for reuse with customer rainwater tanks).
- Fuel usage increased due to the rolling back of COVID-19 restrictions. Additionally, the prolonged wet weather and flood events had significant impacts on Sydney Water's assets, which required considerable reactive works.
- Factors for electricity conversion from KWh to tCO2-e in NSW reduced for the first time in three years by 2 percentage points to reflect the effects of grid decarbonisation and increased renewable electricity consumption across NSW.

FIGURE 3-1 GREENHOUSE GAS EMISSIONS PER 1000 PROPERTIES



Notes:

1. The above figure includes total Scope 1 and Scope 2 emissions (i.e. purchased electricity, fuel combustion and fugitive emissions). Carbon offsets from the surrender of NGACs are not included.
2. Data excludes the Sydney Desalination Plant (SDP) and build-own-operate-transfer (BOOT) contractors. It continues to offset 100% of its electricity consumption with renewable energy.
3. Results use emission factors published by the Commonwealth Department of the Environment in the National Greenhouse Accounts (NGA) Factors. Sydney Water uses the Scope 1 and Scope 2 emissions factors as used for National Greenhouse and Energy Reporting.

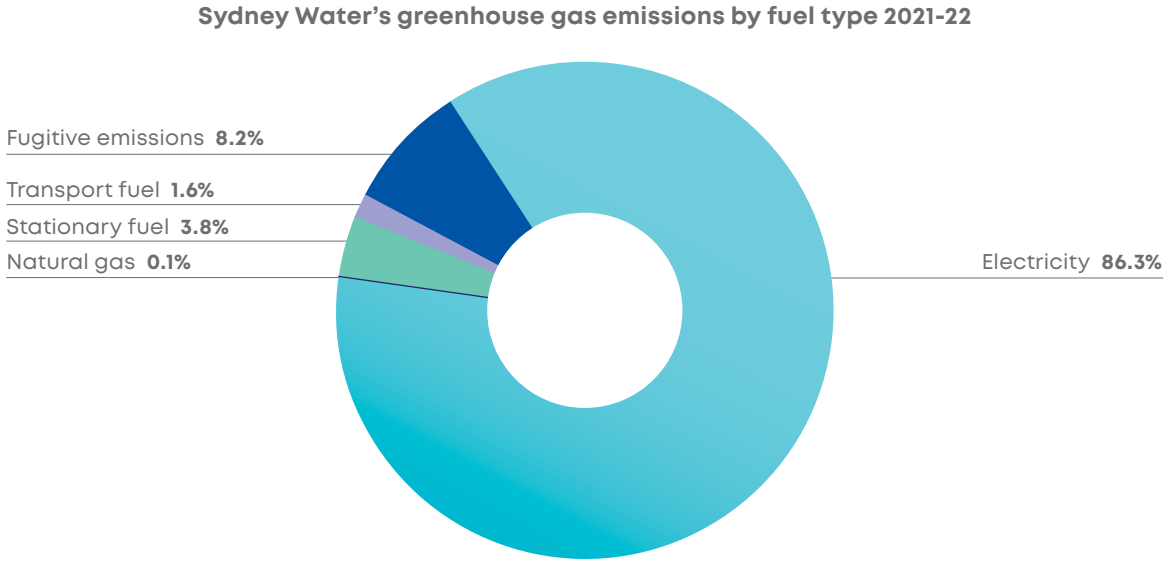
A comparison of greenhouse gas emissions per 1,000 properties for water and wastewater services is shown in Figure 3-1 below. Greenhouse gas emissions for water supply (NWI E9) are relatively consistent with previous years. Higher consumption in 2021-22 was balanced by marginal population growth following the rolling back of travel restrictions during the COVID-19 pandemic. Greenhouse gas emissions for wastewater collection and treatment (NWI E10) were also similar to previous years.

To know more about National Greenhouse and Energy Reporting (NGER), please see the Australian Government's Clean Energy Regulator website at www.cleanenergyregulator.gov.au. A detailed breakdown of GHG activities can be found in Figure 3-1 and Figure 3-2.

TABLE 3-1 SYDNEY WATER'S GREENHOUSE GAS EMISSIONS BY FUEL TYPE IN 2021–22

Cause	Tonnes CO2 equivalent	% of total
Electricity	305,290	86.3
Natural gas	269	0.1
Stationary fuel	13,568	3.8
Transport fuel	5,546	1.6
Fugitive emissions	28,930	8.2
Sub-total tonnes CO_2–e (gross)	353,400	100
Surrender of carbon credits	-	
Contractor emissions	203	100
Total tonnes CO_2–e (net)	353,603	

FIGURE 3-2 2021-22 GREENHOUSE GAS EMISSIONS BY FUEL TYPE

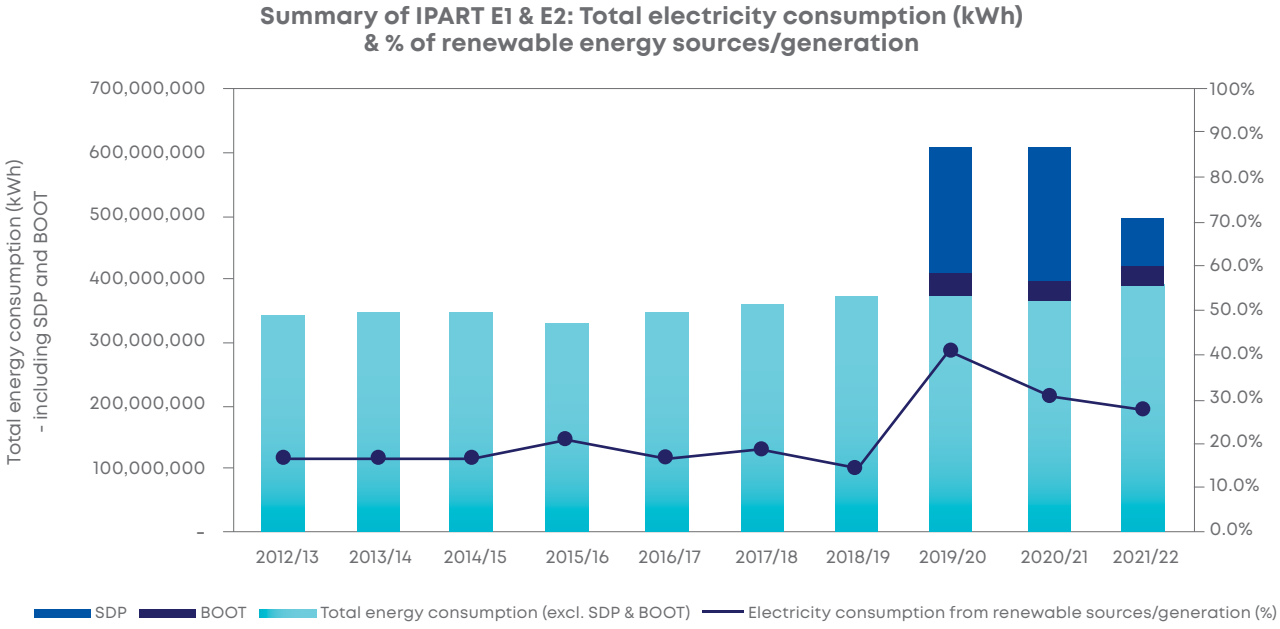


4 Energy

Indicator	Unit	2017-18	2018-19	2019-20	2020-21[9]	2021-22
IPART E1 – Total energy consumption by the water utility in units provided on energy bills [10]	Electricity (kWh)	354,980,726 [11]	372,070,420	377,262,267	365,364,977	386,447,009
	Fuel (L)[12]	2,246,257	2,280,393	3,127467	4,439,968	4,877,690
	Gas (MJ)	5,459,495	5,458,816	7,026,228	6,364,680	5,235,915
IPART E1 – Total energy consumption by the water utility – electricity -in units provided on energy bills (kWh) – including SDP and BOOT[13]		5,459,495	5,458,816	7,026,228	6,364,680	5,235,915
NWI IE3 Volume of wastewater treated to a tertiary level (ML)		N/A	N/A	606,502,995	474,826,264	496,312,401[14]
IPART E2 Electricity consumption from renewable sources or generated by the water utility expressed as a total percentage of electricity consumption • excluding SDP and BOOT		18.7%	17.5%	15.5%	15.7%	12.2%
IPART E2 Electricity consumption from renewable sources or generated by the water utility expressed as a total percentage of electricity consumption • including SDP and BOOT		18.7%	17.5%	41.2%	28.5%	25.8%[15]

9 2020-21 data has been updated retrospectively, following 3rd party audit review prior to NGERs submission through the Clean Energy Regulator.
10 Electricity consumption data only includes energy used by assets under Sydney Water's control.
11 In 2019-20, Sydney Water engaged the Regional Delivery Consortium (RDC), as a partner to deliver design, construction, maintenance and facilities management. Fuel consumption includes RDCs data in addition to other third-party service providers. In 2021-22, the Contractors' fuel consumption is 2,735,113 litres, which accounts for 56.3% of total fuel consumption at Sydney Water.
12 2017-18 figure corrected to align with the Reporting Manual definition.
13 The reporting matrix changed in 2019-20 after the 2018-19 audit review. E1 reporting for 2019-20 now includes electricity consumption by build-own-operate-transfer (BOOT) contractors and Sydney Desalination Plant (SDP). Previously these sources were not included. The total BOOT and SDP electricity consumption in 2021-22 is: 109,865,392 kWh, which accounts for 22.1% of total electricity consumption at Sydney Water throughout the year.
14 Illawarra water filtration plant data was unavailable at the time of reporting for 2021-22, as a result 2020-21 data has been used to estimate usage.
15 Total electricity consumption includes SDP and BOOT contractors' data per E1 requirement. For 2021-22, the electricity consumption from renewable resources for BOOT contractors is 26.3% and SDP is 100% powered by renewable energy. Sydney Water (excluding SDP and BOOT contractors) consumed 12.8% electricity consumed from renewable generation onsite.

FIGURE 4-1 SUMMARY OF IPART E1 & E2



Note: From 2019-20, BOOT and SDP data are included in E1 total electricity consumption.

IPART E1 – energy consumption electricity, fuel, and gas

Electricity consumption

Electricity consumption at Sydney Water operations (386,447,009 kWh, excluding SDP and BOOT contractors) increased moderately compared to 2020-21 and subsequent historical figures. Figure 4-1 shows a comparison of this year's performance with previous years.

Sydney Water's goal is to achieve grid electricity consumption equivalent to 1998 levels (367 GWh). In 2021-22, consumption was above the internal benchmark by 19 GWh.

The increase in grid electricity consumption is due to the following factors:

- Significant wet weather throughout 2021-22. Rainfall totals for Greater Sydney were as much as double the long-term average, and 2022 to-date is the wettest year on record. This impacted renewable energy generation across all sites in Sydney Water, with greater operational challenges than experienced in 2020-21 and consequently increased the reliance on grid electricity consumption to operate Sydney Water facilities.
- A greater amount of electricity was required to operate Sydney Water's wastewater pumping stations, which experienced significant inundation and extended pump run-times. Treatment facilities also experienced a significant increase in electricity consumption due the higher inflow volumes.
- The expected wind-down of the Sydney Desalination Plant (SDP) operations in 2021-22 did not occur due to multiple poor raw water quality events necessitating the continuous operation of the plant. The Desalination Plant reached full production mode multiple times during the reporting period and was otherwise on low-production / standby mode.

Fuel consumption

Sydney Water's fuel usage increased in 2021-22 due to the rolling back of COVID-19 restrictions. Additionally, the prolonged wet weather and flood events had significant impacts on Sydney Water's assets, which have required considerable reactive works.

Gas consumption

Gas consumption decreased in 2021-22 as consumption at the West Ryde Laboratories significantly reduced from September 2021 to April 2022. The existing gas hot water units were inefficient in the summer months and were consuming excess amounts of gas. These gas units have been upgraded, and now perform much more efficiently in the summer months when compared to previous years. Winter consumption has stayed consistent.

IPART E2

Total electricity consumption from renewable sources or generated by Sydney Water can be divided into three parts:

- Sydney Water operations: Sydney Water's on-site renewable energy generation (53,012,098 kWh) was 12.2% of total energy consumption in 2021-22. Renewable generation is slightly lower than 2020-21 and other previous years. A number of factors affected the results for 2021-22:
  - Significant rainfall events reduced the efficiency of renewable energy generation at wastewater treatment plants due to variable wastewater quality. See commentary for E1.
  - One of the three Malabar Cogen units experienced fire and cylinder failure in 2019. The Malabar water resource recovery facility continues to operate with just two cogeneration units that are nearing the end of asset life, with multiple faults experienced in 2021-22, reducing overall production. Replacement of key components resulted in the Cogen Units being taken offline multiple times throughout the year and has compounded the poor performance.
  - Prospect Hydro remained offline in 2021-22 due to pipeline maintenance with non-standard configuration. Water quality impacts from heavy rainfall throughout 2021-22 continue to restrict the operability of the generator.
  - North Head Hydro upgrades extended into the 2021-22 reporting period, and reduced capacity was experienced due to excessive vibration following the upgrades (attributable to moments of high intensity volumes due to wet weather).
  - Sydney Water's overall efficiency of renewable energy production was 10% lower (60%) than the previous 2 years (71%) as a result of the issues identified above.
  - SDP: the electricity consumption at SDP is 100% offset by renewable sources (wind power). SDP's operations have remained consistent with 2020-21 figures, as the plant has remained in 'standby' mode to assist with responses to poor raw water quality events.
  - BOOT contractors: Illawarra Water Filtration Plant continues to operate its onsite Hydro to provide renewable energy generation. This energy supplied an estimated 100% of Illawarra's onsite demand in 2021-22, with additional energy exported to the grid. See footnote 4 on page 12 for further information.

5 Biosolids

Indicator	2017-18	2018-19	2019-20	2020-21	2021-22
IPART E5 Estimated total mass of biosolids produced by the water utility (dry tonnes)	36,148	41,379	39,918	40,924	40,241
NWI E8 Percentage of biosolids reused	100%	100%	100%	100%	100%

Biosolids are the nutrient-rich organic material produced when we treat wastewater at our Water Resource Recovery Facilities (WRRFs). Variations in wastewater treatment processes, population and flows to our WRRFs can all affect annual totals. Totals may also include biosolids produced in the previous reporting period, as we don't record totals until after the biosolids are removed from storage facilities.

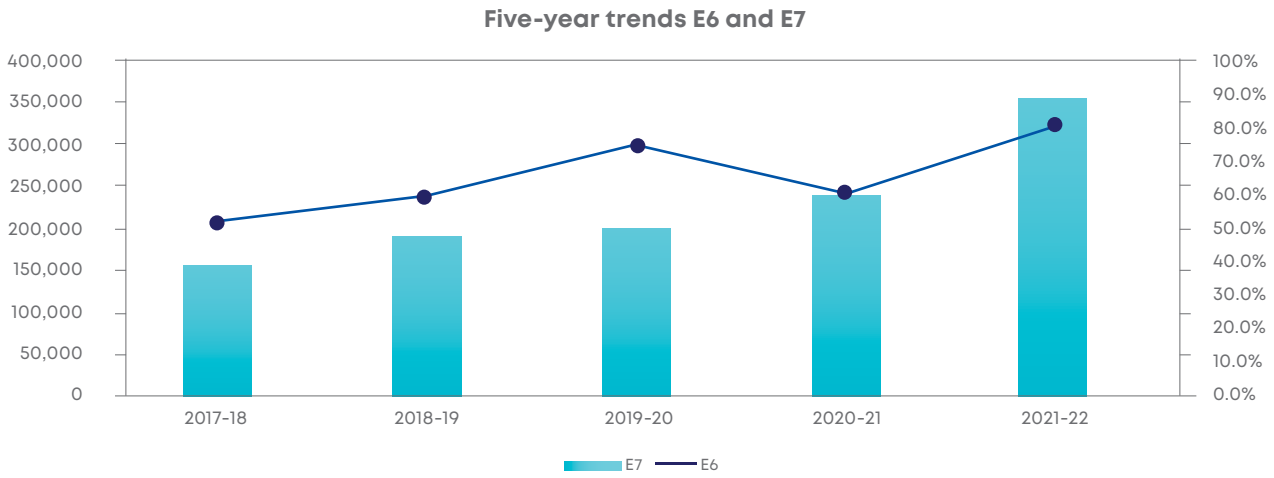
To know more about the use of biosolids, visit www.sydneywater.com.au

Sydney Water has consistently achieved 100% beneficial reuse of biosolids. Biosolids are beneficially used for direct land application in agriculture and forestry or re-processed to produce compost.

6 Waste

Indicator	2021-22
IPART E6 Percentage of solid waste recycled or reused expressed as a percentage of solid waste generated (%)	80%
IPART E7 Estimated total mass of solid waste generated by the water utility (tonnes)	355,973

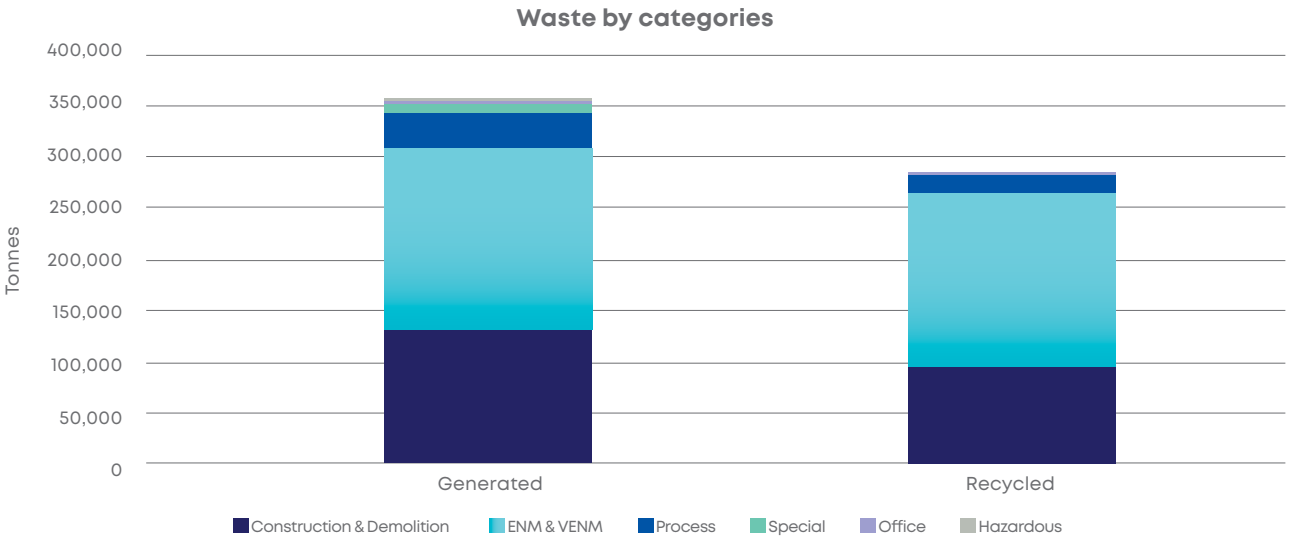
FIGURE 6-1 FIVE-YEAR TRENDS FOR E6 AND E7



IPART E6 and IPART E7

In 2021-22, Sydney Water generated 355,973 tonnes of solid waste, an increase of 48% from 2020-21 (see Figure 6-1). Eighty per cent of this waste was reused onsite, offsite or sent offsite for recycling. The overall recycling rate for 2021-22 was 80%, compared to 61% in 2020-21.

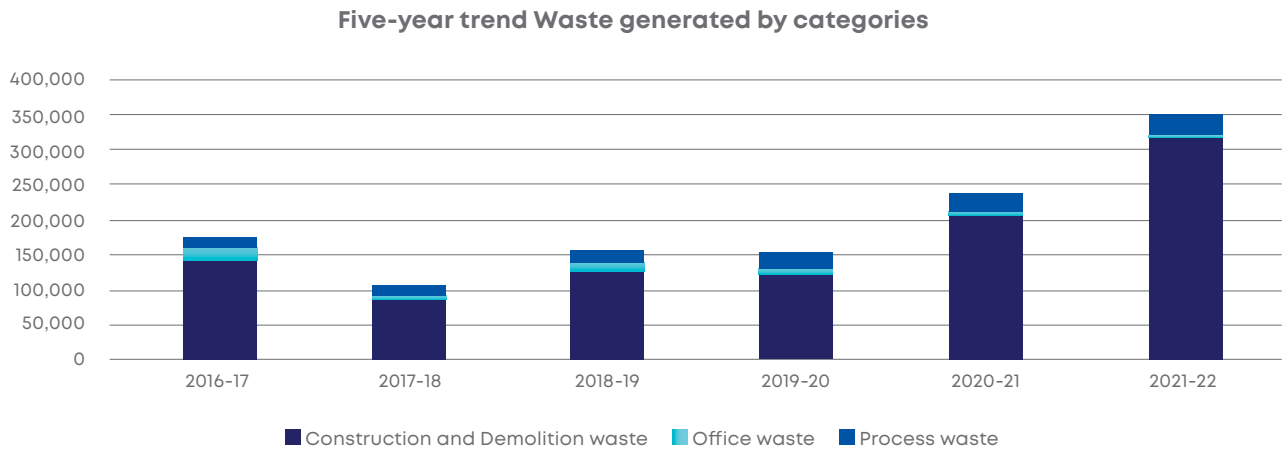
FIGURE 6-2 WASTE GENERATED IN 2021-22 BY CATEGORIES



Our construction and demolition activities were responsible for 90% (319,984 tonnes) of the total waste generated and were the major contributor to the overall generation of waste in 2021-22. Of the waste generated from our construction and demolition activities, 83% (264,568 tonnes) was recycled or reused. This significant increase is attributable to 55% of construction and demolition waste being virgin excavated natural material (VENM) and excavated natural material (ENM).

As shown in Figure 6-2 Waste generated in 2021-22 by categories, special waste (asbestos-contaminated waste) amounted to 11,153 tonnes, whilst 22 tonnes were classified as hazardous waste. Of the total amount of waste generated, about half (177,351 tonnes) was virgin excavated natural material (VENM) and excavated natural material (ENM). Over 95% of this material was recycled or reused. The majority of this material was generated from our major project works.

FIGURE 6-3 FIVE-YEAR TRENDS WASTE GENERATED BY CATEGORIES



Our construction and demolition activities were responsible for 90% (319,984 tonnes) of the total waste generated and were the major contributor to the overall generation of waste in 2021-22. Of the waste generated from our construction and demolition activities, 83% (264,568 tonnes) was recycled or reused. This significant increase is attributable to 55% of construction and demolition waste being virgin excavated natural material (VENM) and excavated natural material (ENM).

As shown in Figure 6-2 Waste generated in 2021-22 by categories, special waste (asbestos-contaminated waste) amounted to 11,153 tonnes, whilst 22 tonnes were classified as hazardous waste. Of the total amount of waste generated, about half (177,351 tonnes) was virgin excavated natural material (VENM) and excavated natural material (ENM). Over 95% of this material was recycled or reused. The majority of this material was generated from our major project works.

Figure 6-3 shows a climbing trend in waste generation. It also shows that construction and demolition waste is the major contributor with a slight increase in process waste as well as office waste generation.

FIGURE 6-4 FIVE-YEAR TRENDS PERCENTAGE WASTE RECYCLED BY CATEGORIES

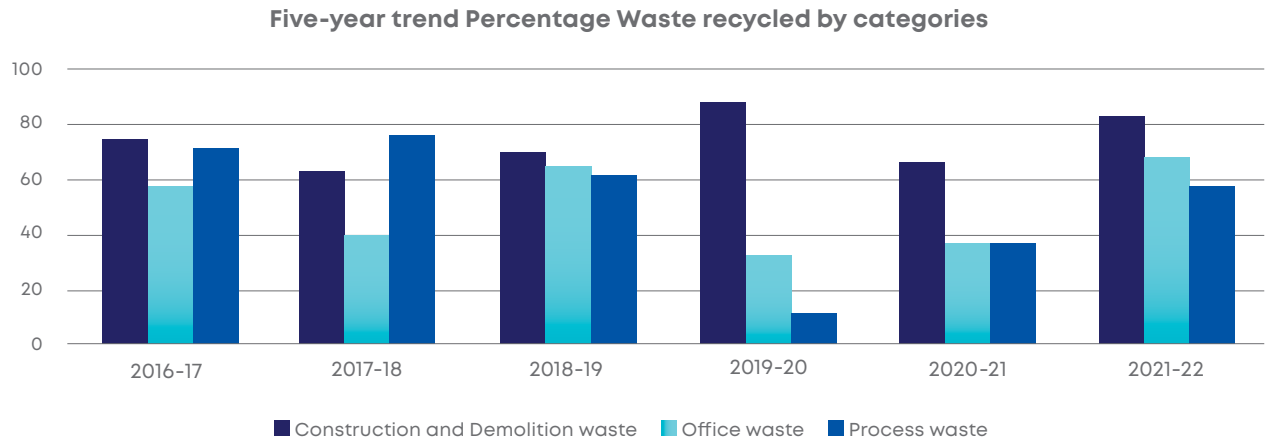


Figure 6-4. shows that the quantities of waste recycled have continued to increase since 2019-20, reaching 285,687 tonnes in 2021-22. This increase in recycling was shown in all three categories, construction and demolition being the major contributor and office waste as well as process waste. The upward trend in recycling indicates Sydney Water's commitment to reduce the quantity of waste sent to landfill.

7 Native vegetation

Sydney Water recognises the importance of maintaining and enhancing biodiversity values through all stages of the project lifecycle. Biodiversity is vital for supporting liveability, and supplying us with clean air, healthy waterways and healthy ecosystems. Out cities' unique natural landscapes are increasingly valued by communities for recreation and for the natural habitats they support. We are committed to protect, restore and enhance our natural environment. We will look for opportunities to maintain and enhance biodiversity values across our project life cycle. We will avoid, minimise and mitigate the impacts of native vegetation removal on biodiversity values before offsetting the residual impacts. The minimum area of native vegetation reported for each project is 0.01 hectares (ha), or 100 square metres. The scale and scope of capital works, the natural and built characteristics of a site, and the timing of reporting influence Sydney Water's performance (refer to Figure 7-1 for historical performance).

Indicator	2021-22
IPART E8 Total area of clearing of native vegetation (ha)	7.83
IPART E9 Total area of native vegetation rehabilitated, including due to replanting, weeding and protection by the water utility (ha) #	16.32
IPART E10 Total area of native vegetation gain due to rehabilitation, replanting, weeding and protection by the water utility (ha) ^	-5.66

Indicator changed from 2017-18, from this year onwards data also includes rehabilitation projects for Sydney Water owned and managed properties.

^ Data reflects either the net gain or loss of native vegetation annually from capital works projects only.

7.1 Capital works and Major projects

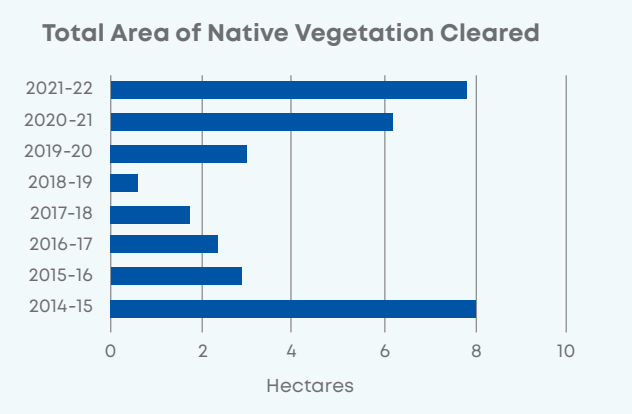
Sydney Water carries out capital works to renew and upgrade its assets, deliver government programs and support urban growth. Since 2017-18, a cumulative total of 19.45 ha of native vegetation has been cleared and 11.6ha has been revegetated or rehabilitated through construction project work. Most of the clearing is temporary, with the disturbed land revegetated through site restoration with native species.

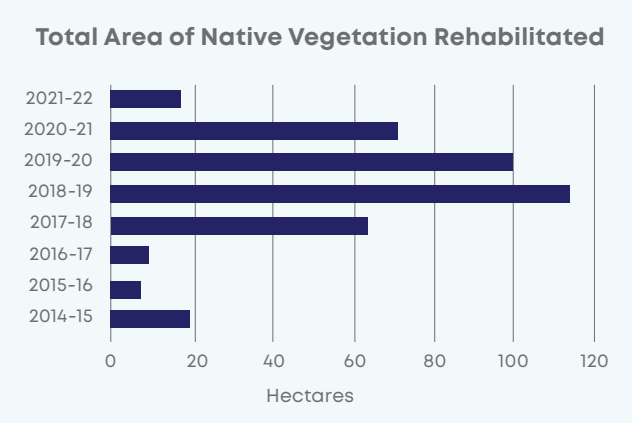
In 2021–22, there was a net loss of native vegetation, with a total of 7.83 ha of native vegetation cleared and 2.17 ha was revegetated or rehabilitated. Prospect to Macarthur Link, Austral Leppington, West Camden WRRF Amplification and Upper South Creek Access Road projects cleared the most, removing 5.9 ha to install water infrastructure. As capital works projects often take longer than 12 months, there is a lag between reporting data on upfront clearing and reporting the completion of rehabilitation, restoration or replanting works. The following projects cleared 1.35 ha of Existing Native Vegetation (ENV) in non-certified land within the Growth Centres:

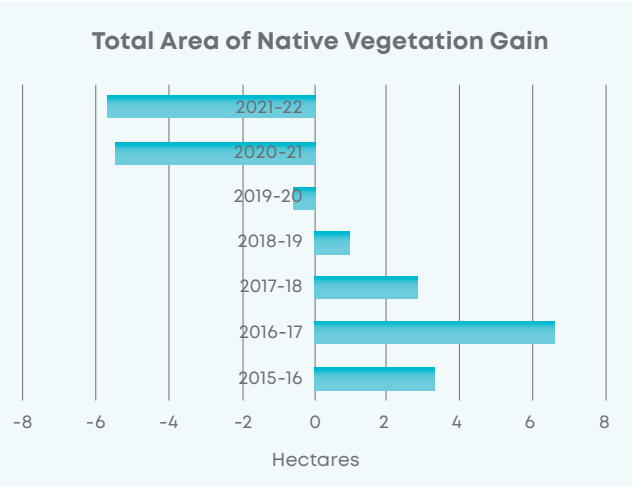
- Prospect to Macarthur Link – 0.79 ha
- Austral Leppington – 0.56 ha.

Sydney Water has a deed of agreement to purchase the required biodiversity credits to an equivalent of 4.05 offset hectares from Greater Sydney Parklands, when they become available in late 2022.

FIGURE 7-1 TOTAL AREA OF NATIVE VEGETATION HISTORICAL PERFORMANCE

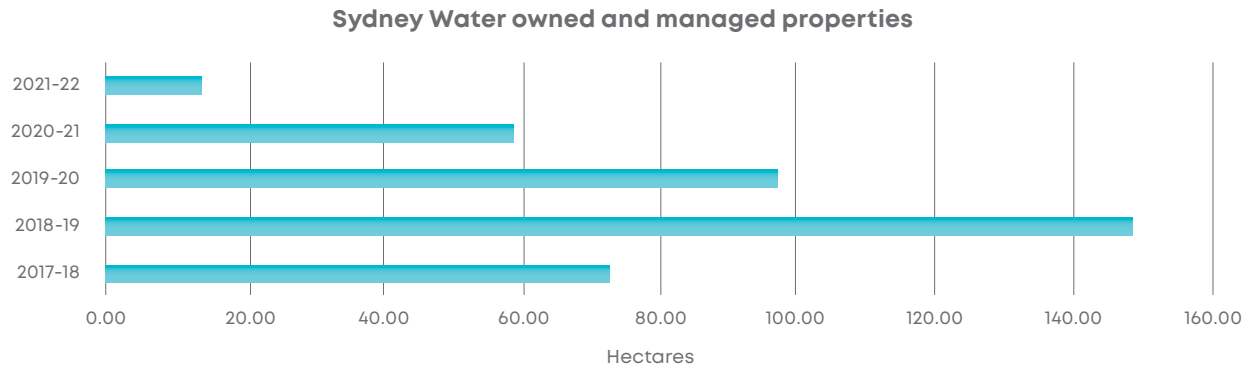






7.2 Sydney Water owned and managed properties

FIGURE 7-2 FIVE-YEAR TREND NATURAL RESTORATION ON SYDNEY WATER MANAGED PROPERTIES



Sydney Water owns over 3,000 properties across its area of operations, including properties with threatened native vegetation, threatened ecological communities and locations with threatened fauna. We also manage 450 ha of riparian lands, wetlands and naturalised stormwater assets.

The total area of land owned by Sydney Water that had natural area restoration work conducted in 2021-22 was 14.15 hectares. These projects were undertaken under our Property Environmental Management Plans, Plans of Management and in response to requirements to undertake weed control works and stormwater naturalisation works. Figure 7-2 shows the five-year trend of natural restoration works conducted on Sydney Water properties.

8 References

IPART (November 2019) Sydney Water Reporting Manual, Operating Licence 2019-2023

Bureau of Meteorology (January 2018) National Urban Water Utility Performance Reporting Framework: Indicators and definitions handbook

Sydney WATER

Website:
sydneywater.com.au

Facebook:
facebook.com SydneyWater

Twitter:
twitter.com/sydneywaternews

Instagram:
instagram.com/sydneywater/

LinkedIn:
Search ‘Sydney Water’ at linkedin.com

SW 59 02/23