Watercare Greenhouse Gas and Climate Change Summary 2024

Watercare is a lifeline utility providing water and wastewater services to 1.7 million people in Tāmaki Makaurau Auckland. Our services are vital for life, keep people safe and help communities to flourish. We supply reliable, high-quality drinking water to homes and businesses and collect, treat and discharge their wastewater in environmentally responsible ways. We manage water and wastewater assets worth over $16 billion and plan and build infrastructure to ensure we support growth today and into the future. The 2023 Auckland Anniversary Weekend flooding, and Cyclone Gabrielle event were stark reminders that we are feeling the impacts of climate change and must do our part to ensure a more resilient future.

Our commitment to climate action has continued throughout the financial year July 2023 to June 2024 (FY24), and our operational targets remain unchanged:

- Reduce operational greenhouse gas emissions by 50 per cent by 2030 (scope 1 and 2)
- Net zero emissions by 2050
- Reduce whole of life (Totex) emissions through our infrastructure delivery programme

During the coming years, we will revisit our approach to infrastructure emissions by considering a 'Totex' view. This reflects the total lifetime emissions (carbon equivalent) impact of new physical assets, including ongoing energy costs, cyclic maintenance and renewal - not just the initial built infrastructure. As this approach is refined, we will confirm any revised targets for our infrastructure programme. Refer further discussion in infrastructure emissions section below.

Our carbon reduction targets are ambitious and will require significant focus and investment to be achieved. This supplement highlights our emissions assessment as well as the impacts, opportunities and challenges of future climate impacts for Watercare, and the services we provide to the communities of Tāmaki Makaurau.

Watercare

History and big changes

We have been improving and refining the way we measure and manage greenhouse gas emissions. This journey started with significant upgrades to the Māngere Wastewater Treatment Plant (WWTP), replacing the open-air oxidation ponds and sludge lagoons with land-based treatment operations in the early 2000s. This enabled us to capture the methane from the solids stream of the wastewater process and turn it into biogas, which is turned into electricity to help run the plant. This approach resulted in a decrease of greenhouse gas emissions by approximately 80 per cent from a 1990 baseline.

In recent times we have focused on the measurement process itself. We improved the reporting framework in FY14 to include additional scope 3 emissions and again in FY20 to update emission factors, adding in new areas of the organisation (e.g. our contract for services in the Waikato District Council) and improving data capture.

The most significant reporting change occurred in 2021, when we updated the approach for reporting emissions associated with our WWTP processes to align with the updated IPCC Guidelines on National Greenhouse Gas Inventories (2019 Refinement), which has a focus on methane and nitrous oxide, two potent greenhouse gases.

This guidance is reflected in the Carbon Accounting Guidelines for Wastewater Treatment: CH4 and N20 in 2021. We have adopted 'Level 2 plant specific assessments' which require plant influent and effluent load, as well as sludge removal information.

The impact of these methodology updates – and our understanding of emissions – was very significant, resulting in an increase in our reported GHG footprint from 45,980 to 103,106 tCO_2e in the FY21 reporting year. This methodology has now been backdated to our 2018 baseline year and is used in our forward reporting.

The last major change to our reported emission profile was associated with the disposal of biosolids at Puketutu Island in Auckland. Biosolids are the solid component product of treated wastewater. We completed research into the quantification of greenhouse gas emission from this single point source, the outcome of which is a further increase in reported emissions of approximately 24,000 tCO_2e (Scope 1) per annum.

Rehabilitating Puketutu Island with treated biosolids from Māngere WWTP.

Investment in direct GHG monitoring of wastewater

We have made great progress in improving our understanding of WWTP greenhouse gas emissions and reporting, but we know there are further improvements we need to make to ensure we have the right information to enhance our processes and manage our impact.

We currently calculate wastewater process emissions according to best practice using the most up to date accepted methodology (using Water New Zealand guidance). However, this calculation method uses WWTP influent flow and concentration nitrogen to estimate nitrous oxide emissions, assuming 1% conversion of total mass of nitrogen to nitrous oxide. As this value is based on a single emissions factor it does not account for differences in processing methods or allow for demonstration of reduction in emissions through process optimisation.

Through this work, Watercare is leading the way in New Zealand and working with international experts to develop methods for directly measuring nitrous oxide emissions with a goal to reduce emissions through process control.

After running pilot tests in our Innovation Centre and applying a pilot to an active plant (Rosedale WWTP), we are extending measurement equipment across four WWTPs, including our largest WWTP - Mangere. This will be completed by the end of 2025. In future GHG reporting we aim to include this direct measurement approach in combination with the calculations that already exist.

Greenhouse gas monitoring and analysis equipment – floating hood and Picarro unit. Rosedale Wastewater Treatment Plant.

FY24 Operational GHG footprint

This past year (FY24) has seen a 15 per cent reduction in total operational emissions compared to FY23, mainly due to a significant portion of our electricity now being purchased from a renewable electricity supplier, reduction in LPG use and a reduction in water treatment process emissions

The extreme weather events early in 2023 were a challenge for the business and led to increases in costs and emissions drivers (e.g. increased flows at WWTPs). This year wastewater flows were closer to the long-term average considering weather and population trends, leading to a decrease in emissions compared to FY23.

We use recognised frameworks for compiling our GHG inventory and our Scope 1 and 2 emissions are independently audited*. However, by their nature, calculating GHG emissions are subject to uncertainty and changing science. This means historical estimates become outdated over time and recalculation of or a change in base year may be required.

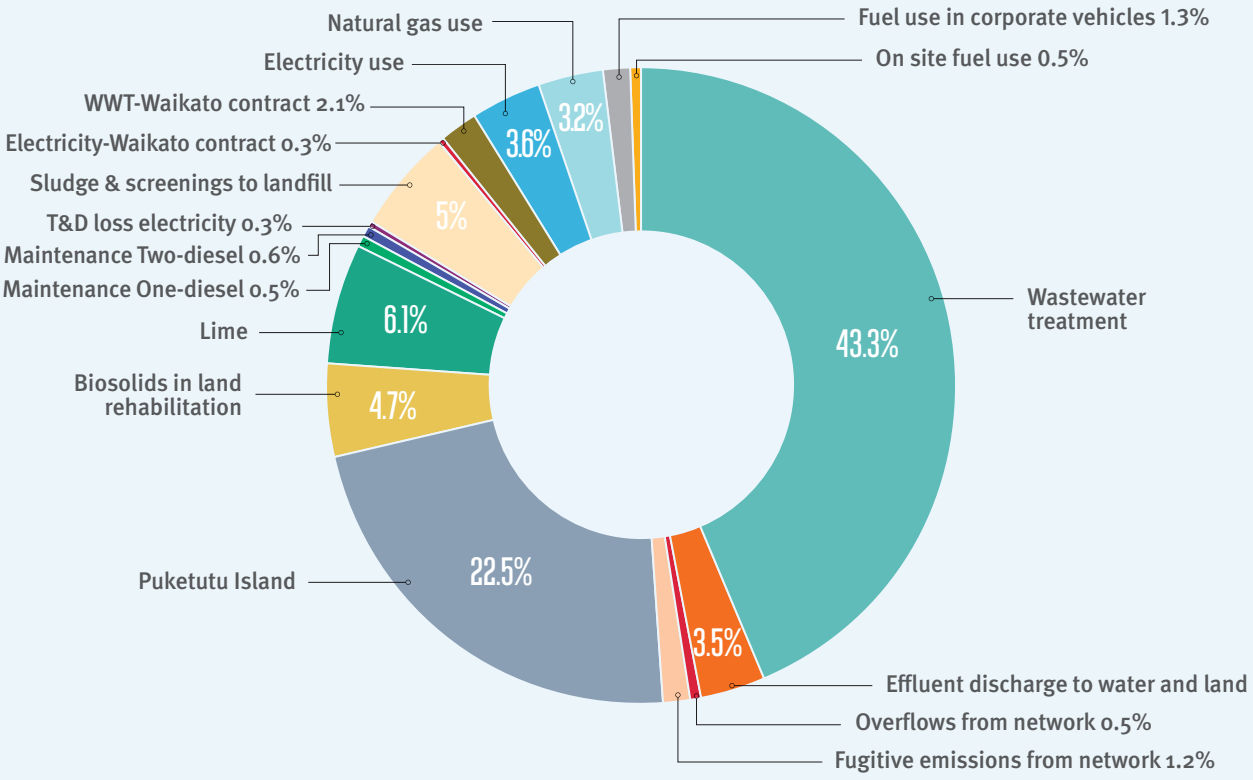
Table 1: Watercare scope 1,2 and 3 greenhouse gas emissions FY24

Scope	GHG Protocol Category	Emission source	t CO_2e	% of total emissions
Scope 1	Stationary combustion	Natural gas use	3,468	3.2%
		Biogas combustion	115	0.1%
	Mobile combustion	Fuel use in corporate vehicles	1,369	1.3%
		On-site fuel use	535	0.5%
	Process emissions	Wastewater treatment	46,483	43.3%
		Effluent discharge to water and land	3,759	3.5%
	Fugitive emissions	Refrigerants	36	0.03%
		Overflows from network	570	0.5%
		Fugitive emissions from network	1,297	1.2%
		Puketutu Island	24,155	22.5%
		Beachlands and Pukekohe on-site sludge storage	5,025	4.7%
	Sub-total Scope 1		86,811	80.8%

Scope	GHG Protocol Category	Emission source	t CO_2e	% of total emissions
Scope 2	Purchased electricity	Electricity use	3,884	3.6%
	Sub-total – Scope 2		3,884	3.6%
	Sub-total – Scope 1 and 2		90,694	
Scope 3	1. Purchased goods and services	Lime	6,568	6.1%
		Maintenance contracts petrol and diesel	1,228	1.1%
	3. Fuel and energy-related activities not included in scope 1 and 2	T&D loss electricity	284	0.3%
		T&D loss natural gas	137	0.1%
	5. Waste generated in operations, subsidiary and WWT	Waste to landfill	6.60	0.01%
		Sludge and screenings to landfill	5,329	5.0%
		Composting of biosolids	179	0.2%
		Sludge transport	115	0.1%
	6. Business travel	Air travel	47	0.04%
		Taxi	2	0.0%
		Private mileage	6	0.01%
		Accommodation	8	0.01%
	11. Use of sold products	Electricity - Waikato contract	348	0.3%
		Petrol and diesel - Waikato contract	187	0.2%
		WWT - Waikato contract	2247	2.1%
	Sub-total Scope 3		16,691	15.6%
	Total Emissions		**107.385**	

* *For FY24 independent assurance was provided by Deloitte in respect of Watercare's Scope 1 and 2 emissions (excluding Puketutu). An operational control approach was used to set the reporting boundary based on areas of direct influence for the organisation.*

Figure 1: Watercare operational greenhouse gas emissions FY24



Overview of wastewater process emissions

Wastewater process emissions (including biosolids handling) are the most significant emission source for Watercare and are driven by methane and nitrous oxide, two powerful greenhouse gasses. These emissions account for approximately 80% of our operational emissions (Scope 1, 2 and 3).

The table below provides more detail on where these emissions occur whilst we treat wastewater to meet quality and environmental standards. Biogenic CO_2 is also reported below, although it does not form part of our targets due to it being part of the Earth's 'short' carbon cycle. By definition, this reflects atmospheric CO_2, which is incorporated into living cells, consumed, respired or combusted (including wastewater treatment) and released back into the atmosphere to start the cycle again.

Table 2: Watercare wastewater process emissions FY24

Treatment system	t CO_2e (non-biogenic CO_2)	tCO_2 biogenic
Overflows from network	570	-
Fugitive emissions from network	1,297	-
Discharge to water and land (nitrous oxide + methane)	3,759	-
Nutrient removal from reactor clarifiers	39,744	-
Anaerobic digestion of sludge – Biogas loss from digester roof	4,944	106
Burning of biogas - CH_4 and N_2O	115	31,352
Emissions from biosolid and grit/screening deposition (third party landfill)	5,329	-
Facultative lagoons	1,204	-
Septic tank, oxidation ponds, other treatment	527	-
Beneficial reuse of biosolids (Puketutu)	24,155	-
Pond 1 Pukekohe and Beachlands drying beds and composting	5,025	346
Total emissions	86,669	31,804

We continue to improve our reporting approach and respond to changes in both the science and GHG reporting. For the FY24 figures, we have continued to follow the guidance from the IPCC AR6 report and adopted emissions factors released by Ministry for Environment in June 2024, relating to the FY24 year These changes did not have a significant impact on our emissions.

Trend/tracking since 2018

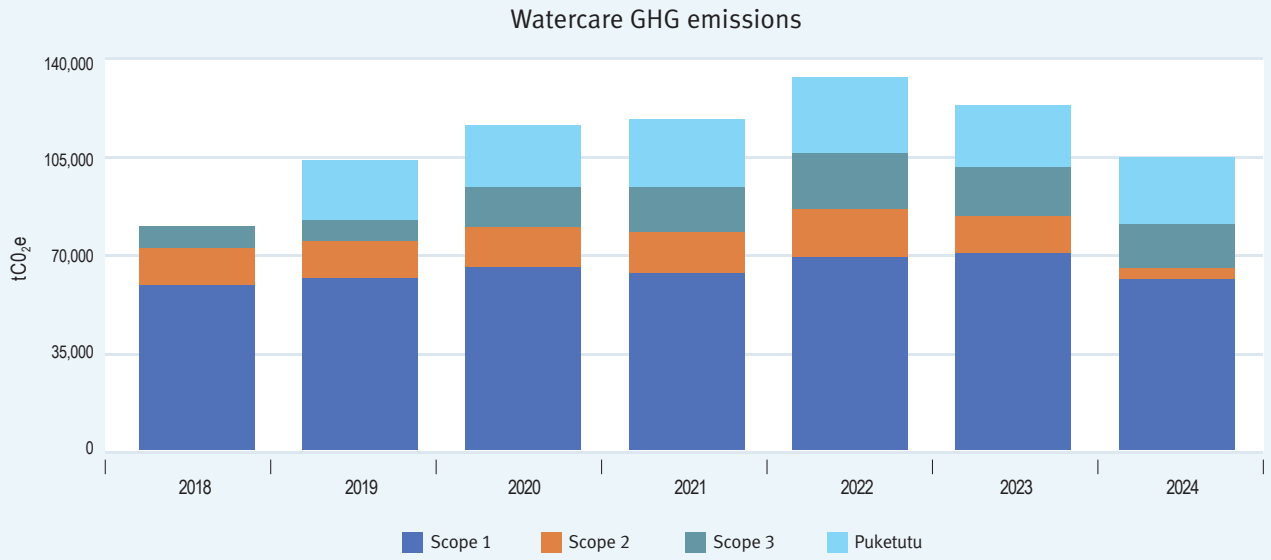
We have been tracking our operational emissions since 2018, with the inclusion of estimates for Puketutu Island emissions since 2019. As anticipated, there has been an increase in emissions (due to growth) over time. In FY24 we have observed a reduction in emissions compared to the previous year. This reduction was due to:

- A reduced volume of wastewater treated which led to a reduction in wastewater related process emissions.
- Reduced electricity consumption and purchase of more than 50 per cent of electricity from a renewable electricity supplier.
- Reduced use of natural gas due to a change in energy production at the Māngere WWTP.

The GHG intensity for delivering water and wastewater services in FY24 was:

- 0.55 kgCO2e per KL water produced (~20% reduction from FY23)
- 190 kgCO2e per connection

Figure 2: Operational greenhouse gas tracking since 2018



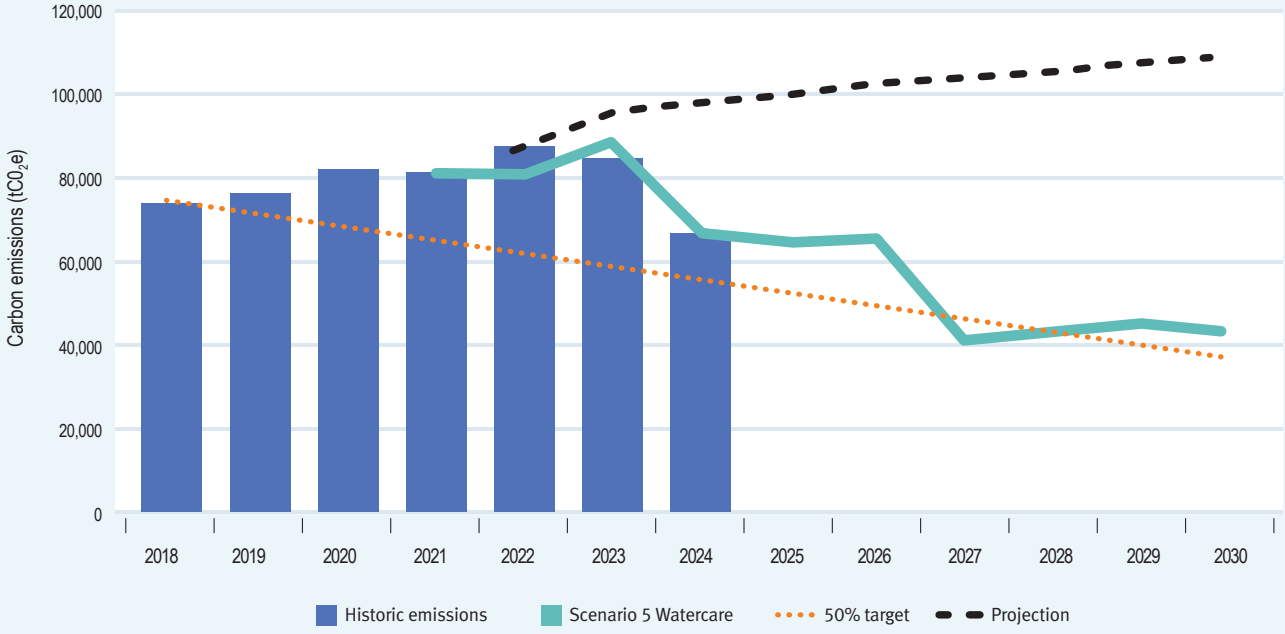
Decarbonisation Roadmap

To meet our target of 50 per cent reduction in operational emissions (scope 1 and 2) by 2030, a Decarbonisation Roadmap was established in June 2022. This roadmap was developed prior to the emissions from biosolids disposal on Puketutu Island being quantified. Figure 3 shows the emissions reduction pathway excluding Puketutu Island.

The reduction roadmap comprises of a list of 39 projects, as well as enabling factors, and was developed through a combination of internal value streams and external support from consulting partners Beca. The roadmap will change as the feasibility of projects is further developed and new projects are identified. At present, the final years require additional projects to meet the target.

The roadmap acknowledges that emissions will grow without intervention. The primary drivers for this are population growth, leading to the delivery of more services, and higher environmental discharge consent requirements which lead to more intensive technology solutions that increase emissions.

Figure 3: Decarbonisation roadmap projection and scenario



In FY24 progress has been made on completing a strategy to reduce wastewater related process emissions, building on the work done as part of the decarbonisation roadmap. A panel was formed with global experts to create a first of its kind strategy in the wastewater sector. This strategy will guide Watercare in actions to reduce process emissions in both the short and long term.

Our approach to action on infrastructure-related emissions

In 2020 we recognised an opportunity to achieve wider value from infrastructure delivery through a programme approach, as opposed to the traditional project-by-project approach and led to a focus on infrastructure carbon across our 10-year programme. Our approach acknowledges that some projects will provide more savings than others, especially those delivered in the earlier years with limited influence on carbon reduction opportunities in the planning and design phases.

Our carbon reduction approach has been informed by the principles discussed in PAS 2080 Carbon Management in Infrastructure.

Watercare infrastructure carbon baseline

To support our infrastructure carbon reduction ambition, we developed and implemented a capital carbon baseline and wider carbon management process. In 2020, the carbon baseline estimated a capital carbon footprint of approximately 374,700 tCO_2e, across the 10-year programme from 2019 to 2029 and helped identify carbon hotspots, providing a focus on priority areas of carbon reduction across the programme.

The asset management programme has had a major update since the 2020 carbon baseline thus requiring the realignment of the carbon baseline to the new programme. We are also implementing a whole of life (Totex) carbon lens to project delivery.

Figure 4: capital carbon by project type for the infrastructure programme (2020 BASELINE)

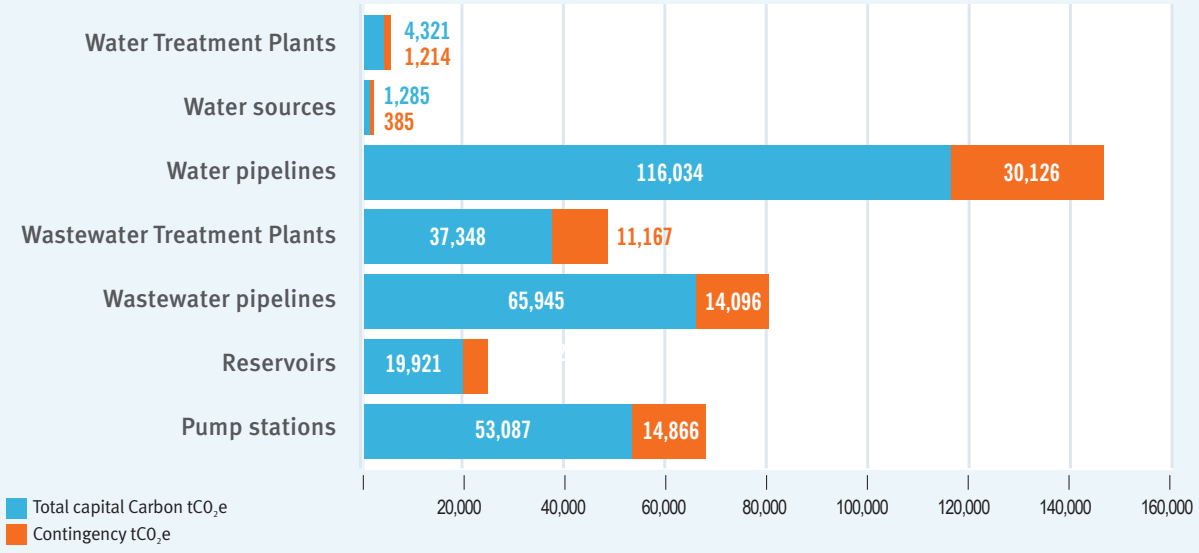
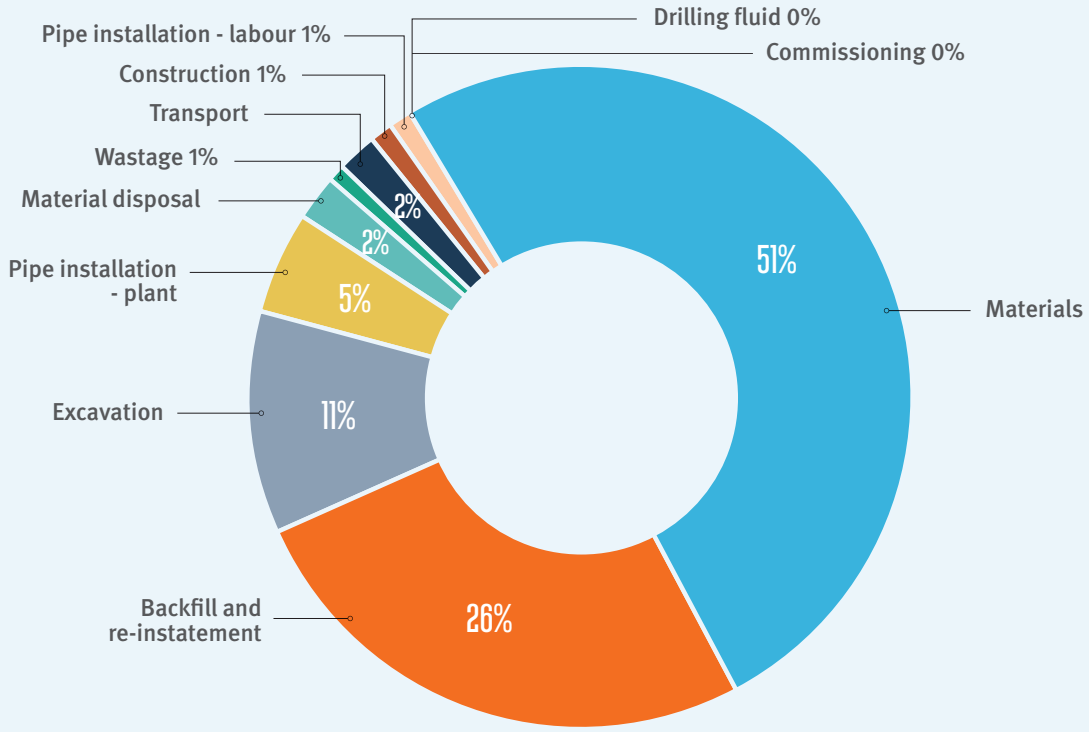


Figure 5: summary of capital carbon hotspots across infrastructure programme (2020 BASELINE)



Estimated 2023/24 infrastructure emissions

We have developed capital carbon intensity rates ($tCO_2e/\$$) based on the data from the carbon baseline that was delivered in 2020. This has allowed us to apply these to the capital spend on infrastructure construction for FY24 to estimate the resulting carbon emissions.

We have equated the capital spend associated with asset construction to estimate a carbon footprint of 33,863 tCO_2e for FY24. This excludes the Central Interceptor, which will be reported separately under the Infrastructure Sustainability (ISC) rating scheme.

Table 3: Carbon footprint estimated based on capital spend for project types

	YTD cost $ (million)	tCO_2e
Wastewater networks	105	14,818
Water supply network	45	11,682
Pump station	9	899
Reservoirs	15	3,357
Reservoir upgrade	6	1
Treatment plant - major upgrade	8	599
Treatment plant - minor upgrade	82	2,508
Total	270	33,864

Notes to the table

- *This information has not been audited but follows the approach that has been described in the Capital Carbon Emissions guidance by Toitū.*
- *Rounded cost figures are selected extracts from FY24 year end project financials report covering infrastructure and drought projects.*
- *Exclusions include capital expenditure from central interceptor, digital, Kāinga Ora, customer, operations, flood recovery and 'other'.*

Infrastructure project emission reductions

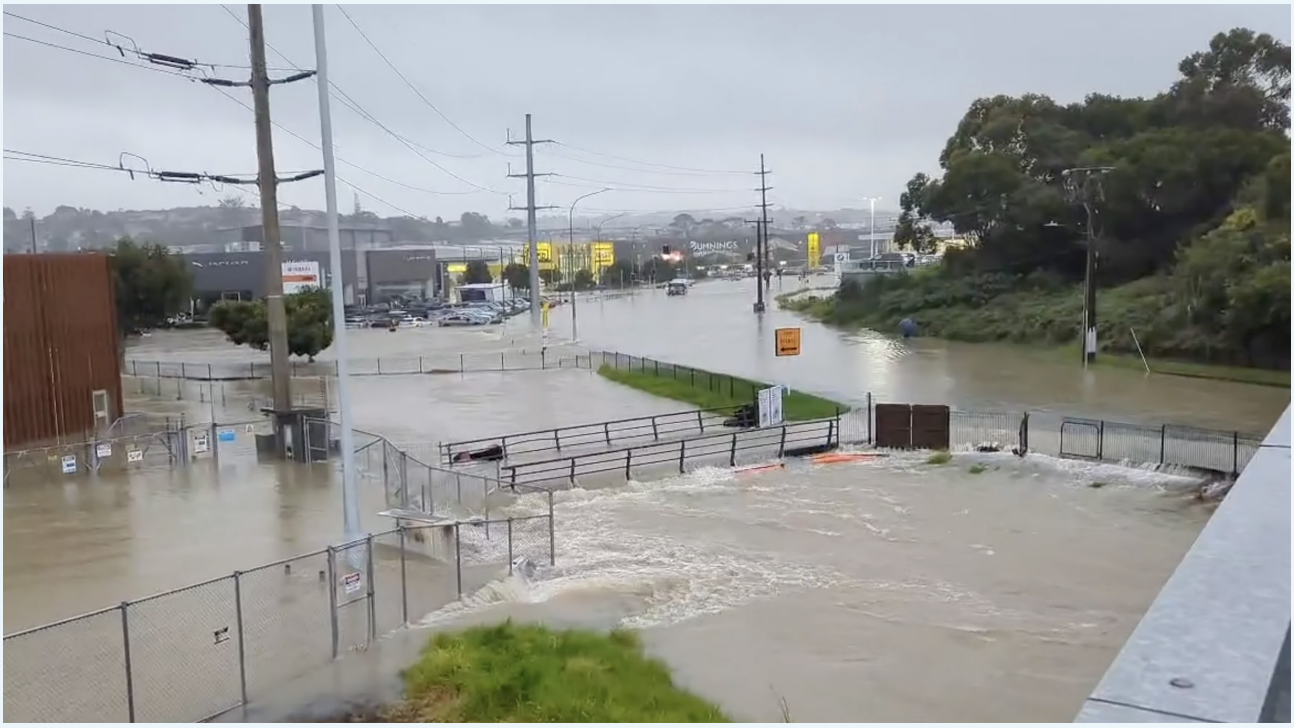
We have utilised the PAS 2080 hierarchy to consider carbon savings across various stages of project delivery. Examples of projects that have achieved significant carbon savings in FY24 are:

- Waiuku Water Treatment Plant concept design saved about 670 tCO_2e, through design optimisation and reducing site footprint.
- Waikowhai watermain project milled and recycled asphalt laid on top of pipe trenches, making a saving of approximately 20 per cent (73 tCO_2e) compared to using virgin asphalt.
- West Boost Pump Station project saved approximately 200 tCO_2e through design optimisation, reducing building size and number of pumps.
- Proactive wastewater pipe renewals in the Elizabeth Street and Palmer Street catchments in Warkworth, which saved approximately 310 tCO_2e, through relining and rehabilitation instead of replacements of pipes at failure.

Climate change risk assessment

Climate change is one of the largest challenges we face as a business. We have identified key areas of vulnerability to climate change through the Watercare Climate Change Strategy 2020 and we are working to refine our approach moving forward.

We completed a high-level risk identification which highlighted key climate related risks across physical and transition scenarios in FY23. Weather events such as those experienced in 2023 constitute some of the many future risks. These identified risks are being refined further through detailed risk assessment and quantification, in conjunction with Auckland Council, and is expected to be completed by June 2025 in order to meet the Aotearoa New Zealand Climate Standards, issued by the External Reporting Board.



Wairau Pump Station, Auckland Anniversary floods 2023

Northwest water networks impacted in Auckland Anniversary floods 2023

A snapshot of the climate change risk identification step is displayed in Table 4. These have not been rated and are not in order of significance or impact.

Table 4: Climate change risk identification

	Hazard / Driver	Risk Element/ Domain	Risk statement	Physical or Transition
1	Changes in the variability of rainfall	Wastewater network	Risk to wastewater network due to changes in the variability of rainfall	Physical
2	Climate change (multiple)	Costs and revenue	Risk to the cost of service delivery due to climate-related disruption (increasing maintenance, capital expenditure to adapt, increasing operational costs, changing consumer profiles and complex customer interdependencies)	Physical
3	Drought	Source water availability	Risk to source water availability due to drought	Physical
4	Drought	Water supply conveyance	Risk to water supply conveyance due to drought	Physical
5	Extreme weather (wind and storm events)	Service delivery	Risk to service delivery due to extreme weather (wind and storm events)	Physical
6	Extreme weather (wind and storm events)	Water supply dams	Risk to water supply dams due to extreme weather (wind and storm events)	Physical
7	From 2035 greenfield development is curtailed	Economy	Risk to Watercare of stranded assets due to constraints on greenfield development.	Transition - Kahurangi
8	Groundwater rise and salinity stress	Source water quality	Risk to source water quality due to groundwater rise and salinity stress	Physical
9	Increased coastal inundation (sea level rise)	Assets	Risk to assets due to increased coastal inundation (sea level rise)	Physical
10	Increased extreme rainfall and flooding	Staff health and safety	Risk to staff health and safety due to increased extreme rainfall and flooding	Physical
11	Increased landslide events	Source water quality	Risk to source water quality due to increased landslide events	Physical
12	Increased landslide events	Treatment plant operation	Risk to treatment plant operation due to increased landslide events	Physical
13	Increased temperature	Wastewater network	Risk to wastewater network due to increased temperature	Physical
14	Intensification Streamlined Planning Process is enacted.	Economy	Risk that response will require unplanned financial resourcing	Transition - Kakariki
15	The EU price on carbon in 2030 is approximately NZD $230. This results in exposure of NZ exports to EU and increased of EU goods coming into NZ	Economy	Risk that water treatment may become excessively expensive	Transition - Kakariki