A synthesis of State of the Environment monitoring in the Manukau Harbour

July 2026

He Mihi

Ko Ranginui e tū iho nei te matua e whakamarumaru nei i a tātou.
Ko Papatūānuku e takoto ake nei te whaea i ahu mai ai tātou te tangata, te papa e noho nei hei tūrangawaewae mō tātou katoa.

Ko Tāne e tū rangatira mai nei hei whakahaumaru i te tangata.
Ko Tangaroa hei whakaāio i te iwi.
Ko te hā o Tāwhirimātea hei hā ora ki te tangata.
Ka heke, ka heke, ki a tātou te tangata.
Haere te wā, haere te wā, ka tini te tangata, ka mahue i a tātou ngā hononga ki te rangi, ki te whenua, ki te ngahere, ki te moana.
Nō tātou te haepapa kia tiakina te taiao, hei whakamana i ngā whakareanga o mua, hei oranga anō mō ngā whakareanga ā muri nei.

Ranginui, our sky father, provides our shelter from above.
Our earth mother, Papatūānuku, from whence all people originate, provides the foundations upon which we stand.
Tāne, god of the forests, stands as our protector.
Tangaroa, god of the seas, helps to calm us.
Tāwhirimātea, god of winds, provides the air we breathe.
We trace our descent from these gods.
Over time, we have multiplied, outgrowing our surroundings and forsaking our familial links to the sky, to the land, forests and seas.
We have a responsibility to care for our environment, to honour past generations and provide for those yet to come.

Kia mārama tātou ki ngā pānga o te tangata ki ngā huringa taiao.
Mā roto noa mai i te pūtaiao me te mātauranga e whakaorangia anō ai te mauri me te wairua o te taiao.
Kua eke te wā e tū ai te tangata hei kaitiaki i te whenua, i te ngahere, i te moana. Nō tātou katoa te haepapa – hoake!

Tuia ki te rangi

Tuia ki te whenua
Tuia ki te moana
Tuia te here tangata E rongo te pō, e rongo te ao

Tīhei mauri ora!

We must understand how we as people have changed our environment. Only through science and knowledge will we be able to restore its mauri and wairua.
Now is the time for us all to stand up as kaitiaki for our land, forests and seas. It is a responsibility we must all share – let us uphold it!
Bind the domain of the upper realm
Bind the domain of the land
Bind the domain of the seas
Bind the tapestry of life which affirms our connection to the natural world and to one another
Let there be life!

Trees and tall vegetation cover **22%** of the catchment

26% of NZ's vegetable production value comes from the Pukekohe growing area

A **CATCHMENT** of forests, farmland, waterways and communities

Home to over **30** shorebird species and at least **10** seabird species

3 regional parks and **726** local parks

THE MANUKAU HARBOUR 2026

395,000 people live in the harbour catchment

More than **450 km** of shoreline

~ 920 km² catchment

56% exotic grassland

17% urban areas

12% indigenous forest

7% cropping and horticulture

Intertidal areas cover over **60%** of the harbour

The harbour entrance reaches depths over **45 m**

New Zealand's second-largest harbour covering **~370 km²**

Each tide moves about **200 billion** litres of water

Over **350** streams flow into the harbour

Ngā Rārangi Take / Contents

Kupu whakataki / Introduction

The Manukau Harbour is a large, productive, and important body of water for both Tāmaki Makaurau and Aotearoa. The harbour and surrounding catchment contain a diverse range of habitats that support a wide variety of plants and animals. The coastline, catchment, and harbour are also important to people. These areas are of great spiritual and cultural value to mana whenua and hold a mauri that binds people to the land and sea. They are places to live, places to work, and provide space and opportunity for recreation.

The Manukau Harbour is the second largest estuary in Aotearoa (with a surface area of ~370 km^2) and drains a comparatively small catchment (~920 km^2). The dominant land use varies considerably around the harbour, with indigenous forest and scrub/shrubland to the north (part of the Waitākere Ranges), urban areas (including industry) to the east, and exotic grassland and cropland to the south (including the Āwhitu Peninsula).

Auckland Council carries out long-term State of the Environment monitoring across the region, including in and around the Manukau Harbour. Monitoring in the Manukau began in 1969, with several programmes now spanning several decades. In 2021, A Synthesis of State of the Environment Monitoring in the Manukau Harbour provided a comprehensive overview of the harbour, including its ecological values, monitoring programmes, and catchment initiatives.

Following this, Auckland Council has been developing a strategy to achieve better environmental outcomes for the Manukau Harbour. The strategy provides an overarching framework and clear direction intended to support Auckland Council and Council-Controlled Organisations to prioritise, coordinate and align investment and activities over time to achieve these outcomes.

As part of this strategic work the Manukau Harbour Environmental Assessment, published in 2025, provides an evaluation of drivers, pressures, state, impacts, and responses relating to the environmental health of the harbour, drawing together findings from the 2021 synthesis report.

In September 2025 Auckland Council published the five-yearly regional State of the Environment report which brought together results from technical reports, covering the state and changes over time in air, land and water domains, to tell the story of the health of our natural environment across Tāmaki Makaurau.

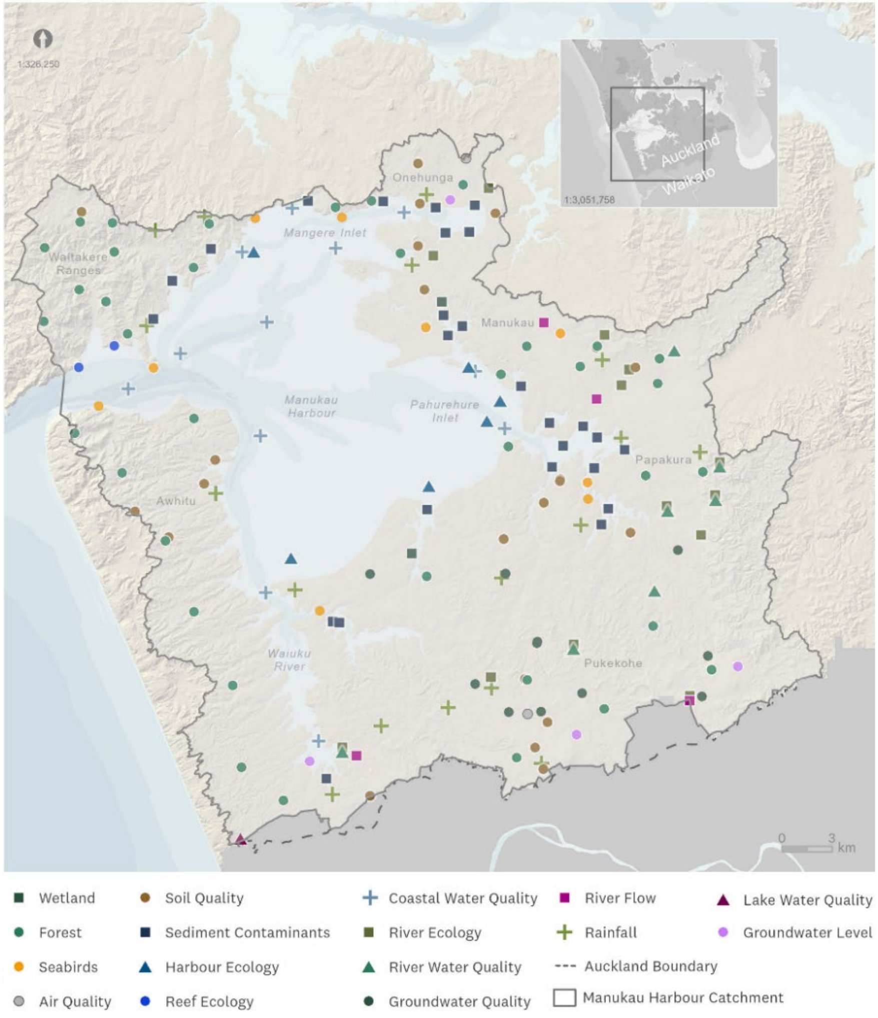
In this report we provide an update to the monitoring presented in the first Manukau Harbour synthesis report, using the latest regional monitoring data to assess the current state of the harbour and its catchment. It supports the development of a Manukau Harbour Strategy and will inform an update to the Manukau Harbour Environmental Assessment.

Tā mātou hōtaka aroturuki ā-rohe / Our regional monitoring programme

Auckland Council monitors the environment in the Manukau Harbour and surrounding catchment as part of our State of the Environment monitoring programme. This monitoring measures environmental health, tracks changes over time, and identifies emerging issues.

This synthesis report is underpinned by 16 technical reports providing in depth analysis and interpretation across air, land, freshwater and coastal monitoring programmes. These reports are available on [Knowledge Auckland](#) and are linked throughout this document.

Ngā wāhi ka aroturukihia e mātou / Where we monitor



State of the Environment monitoring sites in the Manukau Harbour and catchment.

Ngā mea ka aroturukihia e mātou / What we monitor

Hau / Air

Air Quality pollutants (nitrogen dioxide, carbon dioxide, ozone, particulate matter etc.) are measured continuously at permanent monitoring sites distributed throughout the region.

Whenua / Land

Soil Quality monitoring is carried out across different land use types providing information about the effects of land uses on soil.

Forest and **Wetland** monitoring collects information on plant species (native, exotic, and pest), bird diversity, and overall ecosystem condition. It helps identify changes in biodiversity, assess key threats such as weeds and pests, and evaluate the effectiveness of management actions.

Wai Māori / Freshwater

Rainfall, River Flow, Groundwater Level, and **Soil Moisture** monitoring help us understand long-term trends and the impacts of droughts, floods, and water use. Data informs management of water resources and provides information for Emergency Management, Rural Fire, and stormwater management.

Groundwater Quality is monitored in some aquifers to understand how activities on the land affect the quality of water that infiltrates into aquifers.

River Water Quality monitoring measures physical, chemical, and microbiological variables that can be affected by land use activities, discharges, and erosion. Water quality affects the mauri (life force) of a water body and its capacity to support healthy ecosystems.

River Ecology monitoring is undertaken to understand overall ecological health and condition. It includes monitoring freshwater macroinvertebrates (e.g., insects, snails, worms, kōura) as well as the habitat available to native plants and animals.

Lake Water Quality and **Ecology** monitoring helps assess lake health and the impacts of human activities. Alongside water quality, native and exotic plant communities indicate overall ecological health.

Te Takutai Moana / Coasts

Seabirds connect the land and sea and are monitored across the region at key mainland, island, and at-sea sites to assess their abundance and condition.

Coastal Water Quality monitoring focuses on nutrients and water clarity which can be altered by land use, discharges, land erosion and activities in the coastal environment. Changes in water quality can affect the plants and animals that live in the marine environment.

Sediment Contaminants are monitored at intertidal sites to assess the levels of copper, lead, zinc, mercury and arsenic present in marine sediments, which can reduce the numbers and diversity of animals living there.

Harbour Ecology monitoring tracks changes over time in the numbers and types of animals living in and on muddy and sandy sediments. They are an important part of regional biodiversity, provide food for fish, birds and people, and provide benefits such as cleaning the water.

Reef Ecology monitoring measures the numbers and types of animals and plants (seaweeds) living on reefs. Rocky reefs are vital for biodiversity, productivity, and coastal food webs. Monitoring helps assess ecosystem health and impacts from invasive species, land-based pollution, and climate change.

Hau / Air

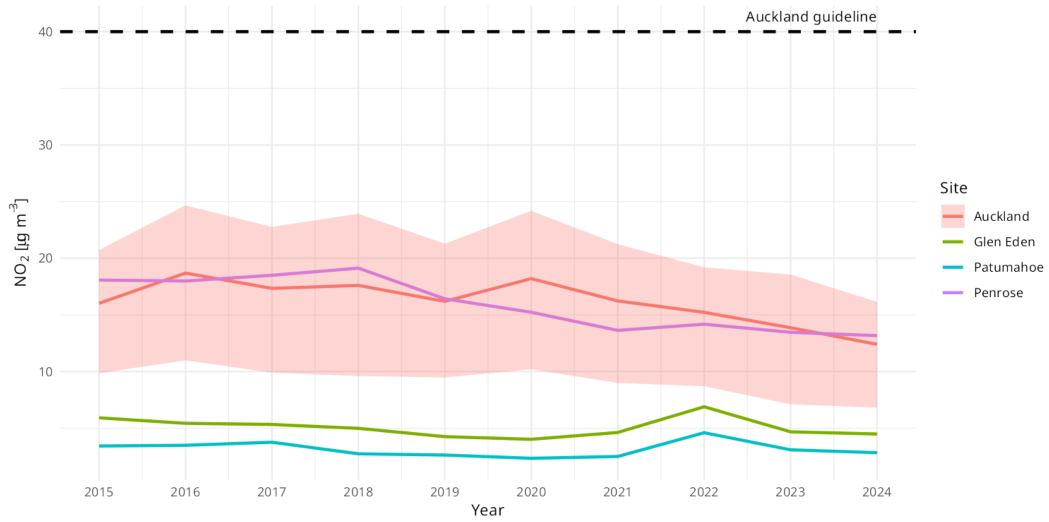
Te Kounga o te Hau / Air Quality

Clean air is essential for protecting human health and wellbeing. Air pollutants can contribute to respiratory and cardiovascular disease, making it important to understand and monitor air quality over time to track these risks, understand how they change, and inform management options.

Surrounding the Manukau Harbour, air quality is complex and varied. Four of the ten regional monitoring sites are located within its catchment, at Glen Eden, Penrose, Papatoetoe and Patumahoe, and they help give insights into the impacts of our activities on the air we breathe.

Over the past decade, air quality at sites around the Manukau Harbour is better than the regional Auckland average for traffic pollution (NO_2), except for the industrial area of Penrose.

For particulate pollution (fine particles suspended in the air) the picture is less straightforward, with concentrations around the Manukau Harbour close to the regional average and showing very little change over the past five years.



Traffic pollution levels (NO_2) at monitoring sites within the Manukau catchment. The shaded area corresponds to the middle range of values (interquartile) across all sites in Auckland.

From the information available, the main sources of pollution in this area are traffic and domestic wood burning but the impact of Auckland Airport and the industrial areas around Wiri and Takanini is largely unknown. To gather more information about the main sources of pollution in this area, an advanced Black Carbon instrument was installed at Papatoetoe in 2025. This instrument estimates the sources contributing to the black carbon pollution and when the project ends in mid-2026, we'll have a much better understanding of which are the more important air pollution sources.

[Read the full regional Air Quality report here.]

Te Haurehu Kati Mahana / Greenhouse Gas

Greenhouse gases (GHGs) are closely linked to air quality and are monitored through Auckland's annual emissions inventory. The GHG inventory identifies and quantifies the main sources of emissions and removals across the region from 2009. Te Tāruke-ā-Tāwhiri: Auckland's Climate Plan sets goals of achieving net zero emissions by 2050, with an interim emissions reduction of 50 per cent by 2030 (against a 2016 baseline). The inventory is an essential tool for tracking progress, guiding mitigation actions, and informing future policy development.

Between 2016 and 2023, Auckland's greenhouse gas emissions decreased by 9.5 per cent (gross) and 8.3 per cent (net), indicating emissions growth has not kept pace with population and economic growth. While this trend is promising, we still have a long way to go.

Despite recent reductions in total emissions, further sustained decreases will be needed over the remainder of the decade to meet the 2030 goal of halving 2016 levels.

Across Auckland, transport is the dominant source of emissions, followed by energy and industrial processes. Because the emissions inventory is reported regionally, activities in the Manukau Harbour catchment are not quantified separately.

However, industrial activities, such as iron and steel production, are present and expected to represent a higher local proportion of emissions than at the regional scale, with transport contributing a lower proportion.

Read the full regional Greenhouse Gas Inventory report here.

Coastal parks and reserves support biodiversity, buffer the coast; and provide opportunities for recreation, education, and connection with the harbour One of three Regional Parks on the harbour's shoreline, Te Ara i Tautahi / Ambury lies on ash-covered lava flows that have shaped this part of the coast. This area is an important bird habitat, with over 80 species recorded, including large flocks of wading birds roosting on the foreshore and nearby islands. Photo: Hamish Allen.

Whenua / Land

The whenua surrounding the Manukau Harbour is diverse, with fertile soils and productive aquifers in the south, and forests and wetlands that filter water and support biodiversity. These landscapes provide vital ecological services, sustain agriculture and horticulture, and hold deep cultural significance for mana whenua. But human activities, including urban development, industry, and intensive agriculture, along with historical habitat loss, have altered these systems and placed pressure on the plants and animals that depend on them. Understanding how land, water, and ecosystems interact is essential for protecting their ecological, cultural, and economic value, and for building resilience to future environmental and climate challenges.

Flanked by two contrasting landforms, the entrance to the Manukau Harbour is one its most dynamic areas. To the south, the Āwhitu Peninsula formed over ~2 million years from layers of sand and sediment carried by the Tasman Sea and Waikato River. To the north, the Waitākere Ranges are the uplifted and eroded remnants of an ancient undersea volcano. Together, they provide a natural buffer between the open coast and the harbour. Photo: Graham Surrey.

Uwhiuwhi Whenua / Land Cover

The way land is used, and how land cover is configured around the Manukau Harbour catchment has a major influence on the health of the surrounding terrestrial environment and the harbour. Land cover is diverse, with different dominant covers in different areas. While the dominant land covers remain the same as reported previously, the extent of these is slowly changing.

Land cover change in the Manukau Harbour catchment was assessed primarily using the Land Cover Database version 6[1] (LCDB v6), the most recent national land-cover dataset.

The catchment remains dominated by exotic grassland, while urban land cover has increased steadily since the mid-1990s.

Exotic grassland still accounts for just over half of the total land area, although it has gradually declined from approximately 53,000 ha in the mid-1990s to around 51,000 ha in 2023. In contrast, urban land cover has increased steadily, rising from about 12,600 ha in 1996 to nearly 15,600 ha in 2023, with urban growth accelerating after 2012 and occurring mainly around the fringes of existing urban centres such as Drury, Karaka, and Pukekohe.

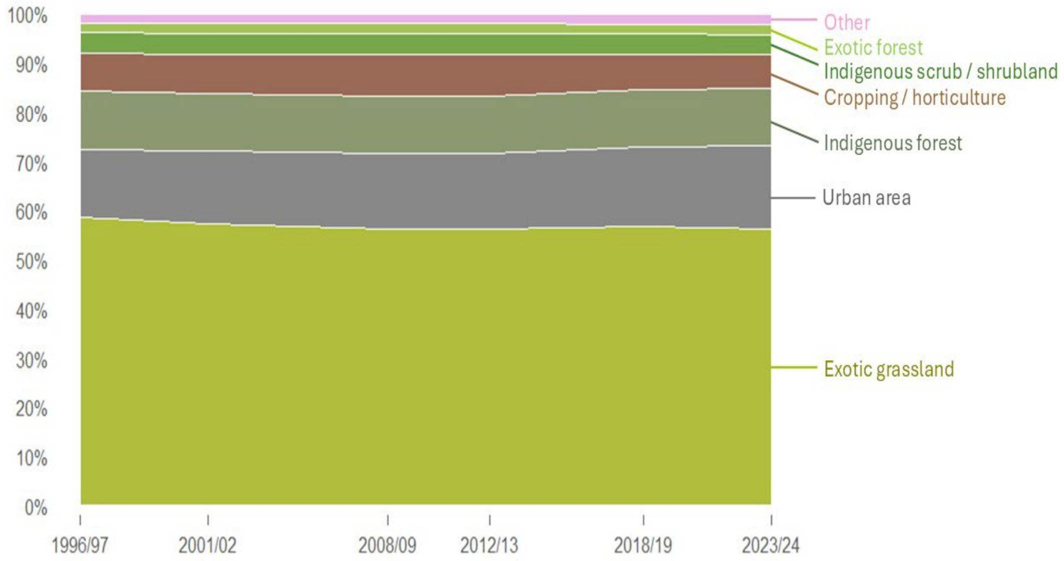
The area mapped as cropping and horticulture has declined from just over 7100 ha in 1996 to approximately 6100 ha in 2023. Much of this apparent change occurs between 2012 and 2018. Despite this reduction, the catchment remains a regional stronghold for this land cover, containing approximately 65 per cent of the region's total cropping and horticulture land. Interpretation of these shifts requires caution, as LCDB v6 incorporates extensive revision of earlier classifications and reflects evolving approaches to distinguishing cropping and horticulture, from other grass-based land uses rather than land-use change alone. Furthermore, hidden beneath this net change are complex local shifts. While urban development continues to expand around town centres, these are countered by a steady conversion of exotic grassland into cropping and horticulture. These dual movements highlight competing pressures across the catchment: ongoing urban sprawl on one hand, and redistribution of rural activity on the other.

Exotic forest cover showed modest increases in the late 1990s and early 2000s, followed by a decline in more recent years, consistent with plantation forestry cycles and some land-use conversion.

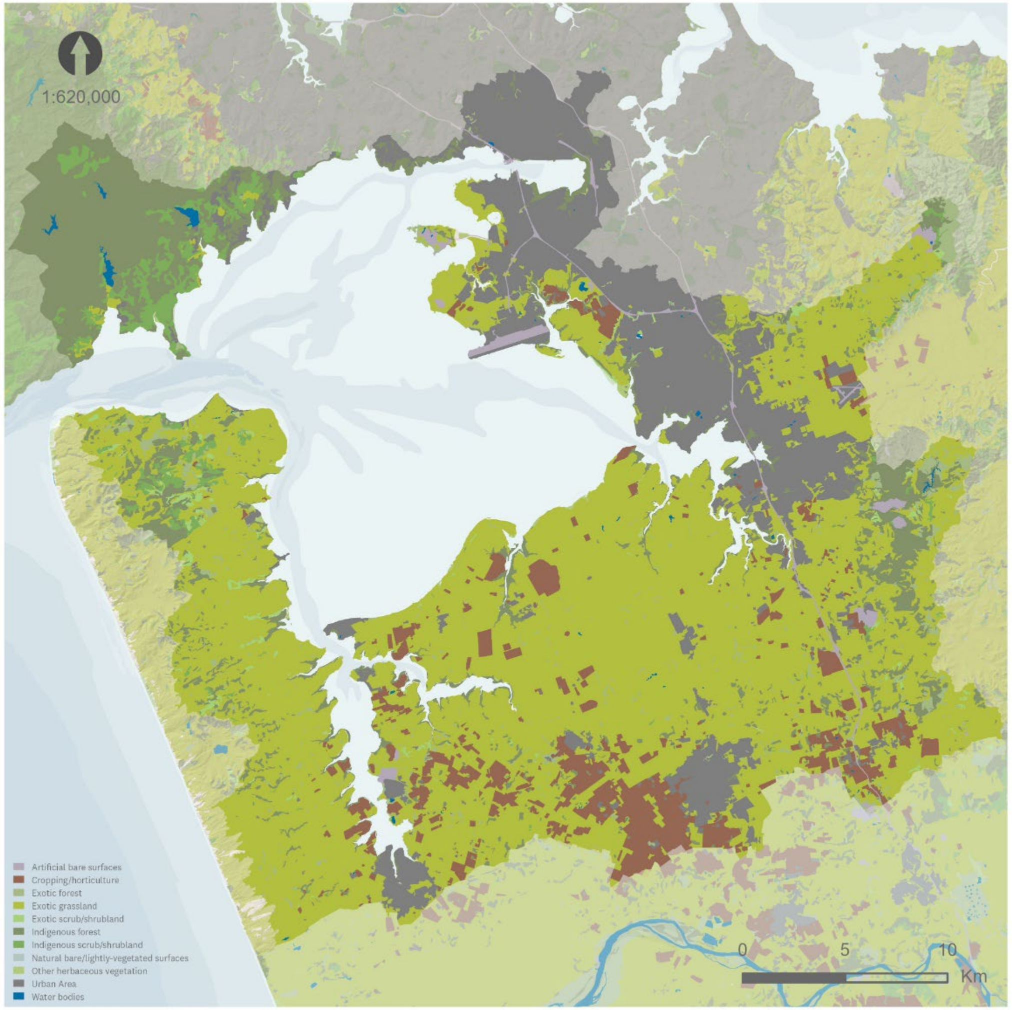
[1] Land cover statistics were derived using the Manukau Consolidated Receiving Environment (CRE); to avoid geometric errors arising from coastline boundaries. LCDB polygons seaward of the coastline were included. The portion of the Manukau CRE within the Waikato region (~2400 ha) was excluded to align with Auckland Council's regional reporting scope.

Indigenous forest and indigenous scrub and shrubland areas remain broadly stable across the LCDB v6 time series, indicating that the overall extent of mapped indigenous vegetation within the catchment has changed little at a catchment scale over recent decades.

Land cover change in the catchment has been assessed primarily using the national LCDB v6 dataset, but also a regionally customised dataset developed for Auckland's State of the Environment reporting. Results differ due to classification methods and updates, so extent and trends do not always align but these differences can reveal useful insights into finer scale changes. Indigenous scrub and shrubland show little change in LCDB v6 (1996-2023), but the regional dataset shows an increase of ~564 ha in the Manukau catchment, indicating vegetation gains important for biodiversity and sediment control. Differences also occur across cropping, horticulture, and exotic grassland, with the regional dataset generally showing higher cropping and horticultural extent.



Change in the proportion of land cover classes within the Manukau Harbour catchment from 1996 to 2023, showing the continued dominance of exotic grassland despite the gradual loss of this land cover to urban area across the time period.



2023/24 land cover in the Manukau Harbour catchment. The 29 LCDB v6 classes present were aggregated into the 11 land cover types used by Land Air Water Aotearoa (LAWA).

Te Kounga o te One / Soil Quality

The catchment surrounding the Manukau Harbour includes areas of highly productive soils, making it an important area for horticulture and agriculture. But healthy soil does more than grow food. It stores carbon and nutrients, helps filter water, and regulates how water moves through the environment. Soil quality monitoring helps link nutrient and trace element levels to land use and management practices, supporting better decisions that improve how land is managed and, as a result, the quality of water entering the harbour.

Our monitoring measures a range of properties to assess soil health. Topsoil (0 -10 cm) samples were collected from 29 sites representing a range of land uses around the catchment (horticulture, native vegetation, pasture and urban) and analysed for key soil quality indicators and trace elements.

Some soil quality indicators fall outside guideline ranges, particularly in more intensively managed land uses, indicating pressures from nutrient enrichment and soil compaction.

Olsen phosphorus concentration, an indicator of plant-available phosphorus (an essential nutrient for plant growth), was very high on both horticulture and pasture sites. This suggests that more phosphorus fertiliser is being applied than crops can take up. Macroporosity (the proportion of large pores in soil that allow movement of air and water) was particularly low on horticulture sites, indicating the soil is compacted. This can lead to greater surface runoff of nutrients and suspended sediments.

Concentrations of trace elements were mostly within guideline ranges but varied with land use. Pasture and horticulture sites had the highest concentrations of cadmium and arsenic, while urban and horticulture sites had the highest concentrations of copper. Urban sites also had the highest concentrations of chromium, nickel and zinc. Across all land uses, comparison of soil quality and trace element indicators between the 2018-2022 and 2013-2017 sampling periods showed no significant changes, indicating that the measured soil parameters have remained largely stable over time.

Read the full regional Soil Quality report here.

Te Kanorau Koiora o te Kūkūwai me te Wao / Wetland and Forest Biodiversity

Forests and wetlands are biodiversity refuges, providing essential and often unique habitats for plants and animals. They support multiple ecosystem functions and services including carbon storage and climate regulation, reducing flood risk by storing water, slowing flows, and reducing peak levels, and limiting harbour sedimentation by slowing runoff, stabilising soils, and reducing erosion. Importantly, our indigenous ecosystems contribute to the cultural, physical and spiritual wellbeing of people.

Forest and wetland monitoring examines how plant and bird communities are changing over time, alongside assessing the overall condition of these ecosystems. Monitoring involves a combination of vegetation plots, bird counts, and condition assessments to provide information on species composition, ecosystem structure, and ecological integrity, helping to describe patterns and pressures affecting biodiversity. Sites are selected regionally using a 4 km grid to ensure broad geographic coverage, alongside more targeted monitoring in key conservation areas. Within the Manukau Harbour catchment, there are 49 forest and 34 wetland monitoring sites.

For biodiversity, the Manukau Harbour catchment contains two contrasting environments. The Waitākere Ranges has continuous cover of mature and regenerating indigenous forest ecosystems and relatively undisturbed wetlands with good hydrological connectivity. In contrast, forests in the remainder of the catchment tend to be small and fragmented, surrounded by urban or rural land-uses, and wetlands that have been disturbed by drainage and land-use change. Regional monitoring has shown that these differences in landscape configuration have a big impact on the ecological integrity of forests and wetlands in the catchment.

Large, continuous forest blocks consistently support higher indigenous plant diversity, including those with a conservation status of threatened, at risk or data deficient.

Our regional monitoring shows that indigenous bird species are more common in areas with high cover of native vegetation, such as the Waitākere Ranges. These areas have seen a recent increase in the populations of some species including tūi, tauhou (silvereye), riroriro (grey warbler) and pīwakawaka (fantail). The presence of endemic bird species vulnerable to predation are largely driven by bird species translocations to safe environments and mammalian pest control effort. Endemic bird counts were highest in areas of mammalian pest eradication (e.g. Te Hauturu-o-Toi / Little Barrier Island). This was followed by pest exclusion to zero density (e.g. fenced mainland islands of Tāwharanui and Shakespear Open Sanctuaries), sustained mammalian pest suppression including the use of broad scale application of toxic bait (e.g. the Hunua Kōkako Management Area), and finally, mammalian pest suppression without the use of broad scale toxic bait (e.g. the Waitākere Ranges Ark in the Park).

Located on the southern coast of the Waitākere Ranges, this monitoring site shows early-stage forest regeneration, with dense growth of tanekaha, large-leaved māhoe, māmāngi, karamū, and kauri. A well-developed understorey suggests relatively low browsing pressure. Much of Tāmaki Makaurau's indigenous forest is regenerating following historic logging, burning, and clearance for timber and agriculture. Photo: Wildland Consultants.

This monitoring site lies within a small remnant of mature pūriri, tōtara, taraire, and kahikatea. White tapes marking the plot remain visible through a sparse understorey, where browsing has removed many palatable species. Kohekohe was the dominant seedling and sapling species, a sign that some pest control is occurring and effective. Limited understorey diversity likely reflects the small forest patch size, isolation from seed sources, and ongoing browsing. Photo: Tītoki Landcare

Small, fragmented forest patches, especially those in urban areas, had higher abundance of exotic and pest plants, while introduced bird species thrived in more modified forest and wetland environments.

Invasive pest plants and nutrient enrichment are two of the main pressures shaping wetland biodiversity, reducing indigenous plant species richness and reducing ecological integrity.

Half of all plant species recorded in wetlands regionally were exotic, while pest plants made up ~20 per cent of all plant cover, with several species increasing in biomass over time. Nutrient enrichment, especially from elevated nitrogen, appears to be changing indigenous plant communities. Raupō biomass was highest and increased most where nitrogen levels were elevated relative to carbon, and areas of high raupō biomass were associated with significantly lower plant species richness.

Indigenous dominance for birds was also low in wetlands, with indigenous species composing only ~55 per cent of all bird species recorded. Indigenous bird species showed a strong preference for undisturbed wetlands but also showed some signs of recovery in more modified wetlands. The abundance of mātātā (fernbirds) was strongly linked to wetland ecological integrity.

[*Read the full regional Forest report here.*]
[*Read the full regional Wetland report here.*]
[*Read the full regional Terrestrial Birds report here.*]

Overlooking a raupō-dominated swamp in a forested gully on the Āwhitu Peninsula. The wetland is in good condition, supported by an indigenous forest and scrub buffer surrounding more than 75% of its perimeter, despite the wider hydrological catchment being dominated by exotic grassland. In the most recent remeasurement, 24 indigenous plant species and four exotic species were recorded, including three pest plants. Photo: Terra Pura.

This swamp wetland illustrates many of the characteristics that reduce wetland ecological integrity. The catchment is predominantly exotic grassland under grazing, and the wetland is only partially fenced, with stock access and trampling evident. Sedimentation and nutrient enrichment were high. In the most recent remeasurement, exotic species made up 86% of plant cover, largely driven by pest plants. Photo: Wildland Consultants.

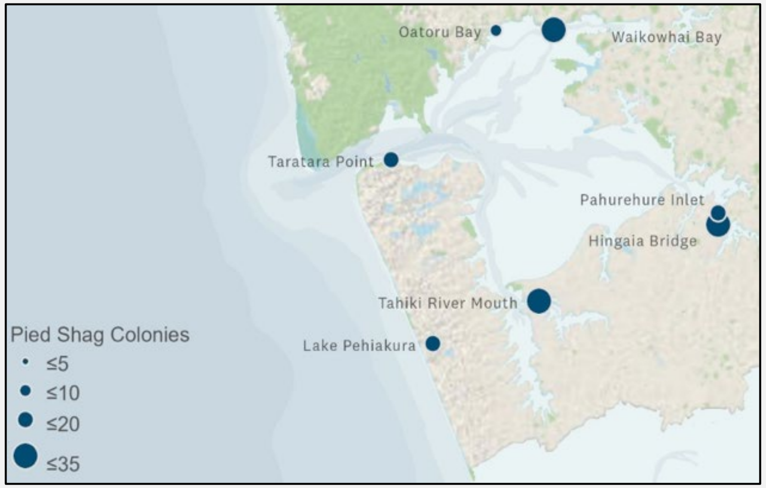
Monitoring shag populations in the Manukau Harbour

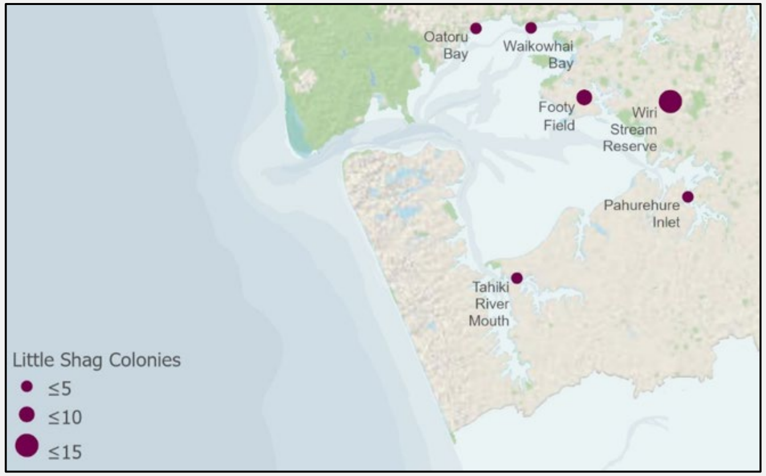
Perhaps more than most species, seabirds depend on both land and sea – land for nesting and roosting, and the sea for food. Among them are shags, large seabirds that breed and forage in marine and freshwater habitats, often along the coastal margins of urban areas. As top predators feeding mainly on fish, they rely on healthy and productive food webs. Changes in shag populations can provide a useful indicator of marine ecosystem health and the overall condition of the harbour.

Because they depend on terrestrial and marine environments, shags are exposed to threats from both. These include entanglement in fishing gear and marine debris, disturbance from people, boats, and dogs in coastal and recreational areas, and habitat loss from coastal development and extreme weather events.

Before the Seabird Research and Monitoring programme began in 2019, there was no regular monitoring of shag species in the Auckland region, and little was known about their population status, trends, or threats. The first step in establishing monitoring was to survey coastal and freshwater habitats across the region to map existing colonies and roosting sites. The Manukau Harbour emerged as a hotspot for shag populations, supported by its large tidal estuaries and shallow, productive waters that sustain the fish and invertebrates they depend on.

Monitoring has shown the harbour supports feeding and breeding populations of four of the five Auckland shag species: pied shag/kāruhiruhi, little shag/kawaupaka, black shag/māpunga and occasional roosting by little black shag/kawau tūī. The Seabird Programme has also established a collaboration with the South Auckland branch of Birds New Zealand, where sightings and colony observations from members contribute valuable information to improve understanding of shag populations in the Manukau.





Maps showing the distribution of pied shag/kāruhiruhi (top) and little shag/kawaupaka breeding colonies across the Manukau.

Read the full regional Seabird report here.

He Whakarāpopototanga mō te Whenua / Land Summary

Across the Manukau catchment, land use is dominated by exotic grassland, with urban areas gradually expanding since the mid-1990s and slowly reshaping the wider landscape. Soil condition indicates ongoing impacts, with some indicators falling outside guideline ranges, particularly in more intensively managed land uses, associated with nutrient enrichment and soil compaction. Remaining areas of indigenous forest act as important ecological strongholds, where larger and more continuous forest blocks consistently support higher indigenous plant diversity, including species classified as threatened, at risk, or data deficient. Wetlands are affected by invasive pest plants and nutrient enrichment, resulting in reduced indigenous plant richness and weakened ecological integrity. These terrestrial patterns are also reflected in bird communities, with indigenous species more commonly associated with areas of higher native vegetation cover.

Together, these findings highlight how strongly ecosystem health is shaped by land use, habitat condition, and connectivity. The extent, continuity, and quality of indigenous vegetation play an important role in supporting biodiversity and ecosystem resilience across the catchment. They also reinforce the close connections between land, freshwater, and marine environments, where changes in soils and land use can influence downstream coastal systems through the movement of water, sediment, and contaminants. This connectivity is reflected not only in physical processes, but also through highly mobile species such as seabirds and shorebirds, which move between and connect aquatic and terrestrial habitats.

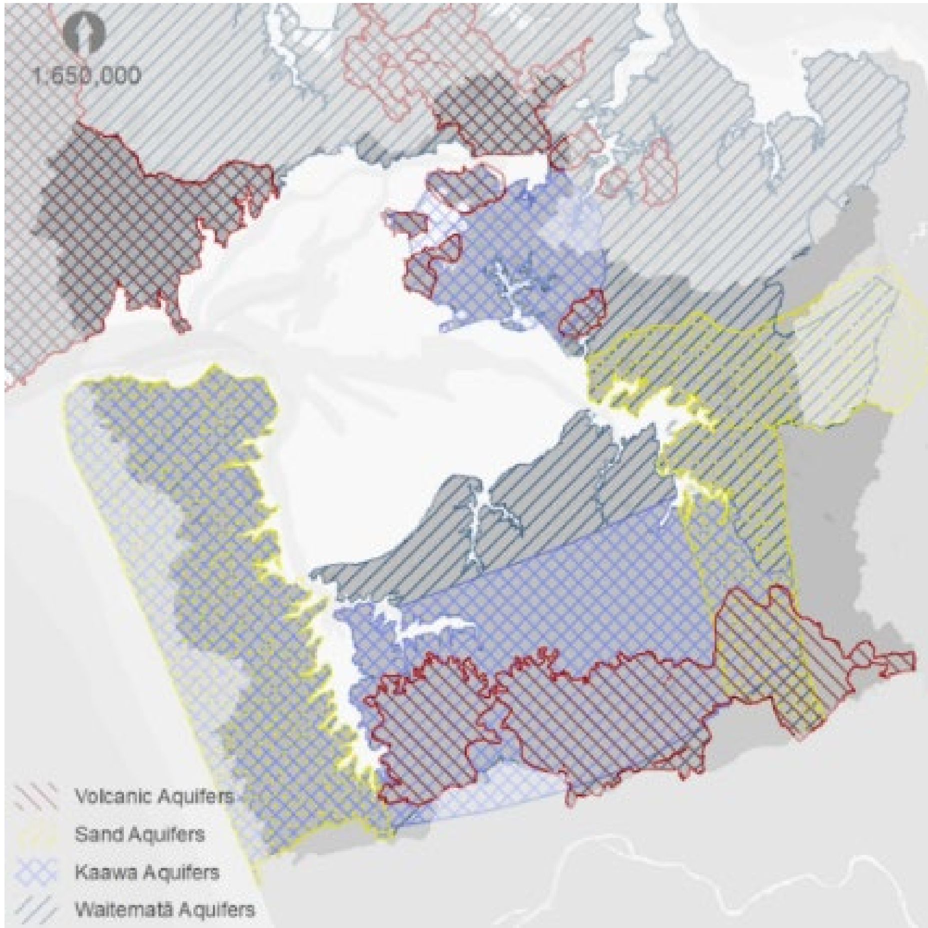
Shags generally nest in mature trees overhanging water, along coastal cliffs, or beside freshwater lakes. The Manukau provides important habitat, with several colonies and roosting sites recorded around its coastline. This pōhutukawa on the northern shoreline shows the distinctive white staining typical of shag roosts, caused by guano (bird droppings). Photo: Jonathan De Villiers

Wai Māori / Freshwater

The freshwater environments of the Manukau Harbour catchment form a network that links the land to the harbour. There is no single large river entering the harbour; instead, many short streams flow directly into the harbour at many points around its edge. In the north, natural stream flows have been modified by the drinking water reservoirs in the Waitākere Ranges, while streams in the north-east and eastern areas, have been heavily modified by urban development and rural activities. There are several lakes in or near the catchment, including dune lakes around the Āwhitu Peninsula, and old explosion craters (though most have been filled).

The area's volcanic geology has created a complex system of shallow and deep aquifers, particularly in the central isthmus and the southern rural areas where they provide a steady supply of water to streams around Pukekohe and Waiuku. They also represent an important water supply, with around 30 per cent of consented water takes in the region occurring within the southern aquifers.

What happens on the land influences streams directly, through overland flow, and indirectly, via groundwater. Together, these freshwater systems deliver water, sediment and nutrients to the harbour, helping to shape its water quality and ecological health.



This map shows the distribution of aquifers in the Manukau Harbour catchment, highlighting a range of shallow and deep groundwater systems. Volcanic and sand aquifers are generally shallower and more permeable, supporting localised groundwater flow. In contrast, Kaawa and Waitematā aquifers are older, more consolidated units that form deeper, extensive groundwater systems. Together, these aquifer types reflect the catchment's complex geology, which controls groundwater storage and movement.

Mātai arowai / Hydrology

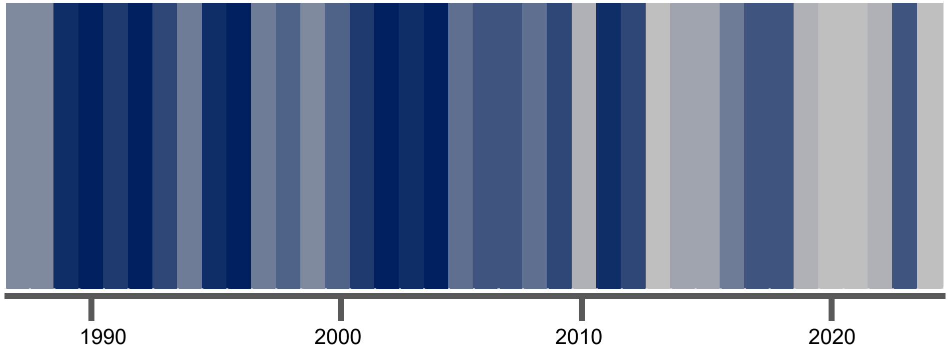
Hydrology is the study of where water is found, how it travels through the landscape, and how it changes over time. In the Manukau Harbour catchment, this means looking at how rainfall, rivers, and groundwater are connected, and how they respond to changing environmental conditions.

Rainfall monitoring sites are distributed right around the catchment from the Waitākere Ranges to the suburbs, southern rural areas and the Āwhitu Peninsula. While no significant long-term trends in average rainfall have been identified at the five locations assessed in the latest monitoring report, the record is characterised by strong year-to-year variability. The extreme weather events experienced across much of Auckland in 2023 were particularly prominent, with rainfall exceptionally high and unevenly distributed across the catchment. Totals in the 2022/23 summer ranged from around 600-800 mm in the south and east and exceeded 1000 mm north of the Manukau Heads and adjacent Waitākere Ranges. This was equivalent to an increase of between 250 - 450 per cent above normal annual rainfall in many areas. At most sites, record-breaking short-duration intensities were associated with the 2023 Auckland Anniversary weather event.

Across recent years, extreme rainfall events have played a dominant role in shaping the hydrological conditions across the catchment.

River flow monitoring across the catchment also shows a clear response to recent climate extremes, with record low flows during the 2019-2020 drought and record high flows during 2023 at many sites. At the Waitangi flow site, located just out of Waiuku, there was a marked increase in time where water levels were below typical low flow conditions, largely influenced by the preceding drought conditions. As the climate changes, these swings between record high and low flows can be expected to continue.

Groundwater levels show contrasting patterns across the catchment. In the eastern parts of the catchment around Onehunga, long-term trends indicate a gradual rise in groundwater levels, this is mainly due to artificial recharge within the catchment. In contrast, the Maraeorahia aquifer (northwest of Waiuku) shows declining trends water levels across both annual and seasonal timeframes, suggesting increasing pressure. This is likely linked to a mix of land use activities in overlying areas and climate variability. Extending across the same broader eastern and southern catchment, soil moisture monitoring at Māngere, Waitangi, and Āwhitu is generally within expected ranges, apart from a notably wet 2023 autumn at Āwhitu.



Groundwater levels in the Maraeorahia aquifer represented as "climate stripes". Each stripe represents a year starting at 1987 (the first full year of monitoring) and ending in 2024. The colour represents the number of months each year that the groundwater levels are in deficit (lower than the average for that month), where dark blue indicates a small number of months and grey indicates a larger number. This shows an increasing length of time with lower-than-average water levels, and the effect of climate variability.

Read the full regional Hydrological report here.

Te Kounga o te Wai Whenua / Groundwater Quality

Groundwater sits beneath the surface in the spaces between soil, sand, and rock. It forms as rain soaks into the land, moving slowly downward and collecting in natural reservoirs known as aquifers. From there, it flows gradually through underground layers, eventually feeding streams, rivers, and coastal waters. Activities at the surface can affect this hidden resource. Chemicals and nutrients can seep through the soil and contaminate aquifers, meaning any activities on land have the potential to impact groundwater quality. Understanding these impacts is important for assessing risks to reliable water supplies and the wider environment.

Long-term monitoring of groundwater quality tracks conditions in key aquifers across the region, particularly in areas where groundwater use is very important, or where quality is considered at risk (either now or in the future). Of the aquifers that drain towards the Manukau Harbour, there are 14 sites to the south in the wider Pukekohe area, and one to the east in Onehunga.

High nitrate concentrations in the shallow aquifers of the Pukekohe area remain a concern. At some sites, concentrations exceed safe drinking water guidelines, reflecting long-term impacts of intensive horticultural activity.

These elevated levels are unlikely to decline quickly because groundwater moves very slowly through these aquifers, often taking decades to pass through. These aquifers also contribute nitrate-laden baseflow to the local streams, which means that some of these streams then exceed national thresholds to protect aquatic life from toxicity. While nitrate levels in groundwater appear stable, no improving trends have been observed in the most recent groundwater state and trends assessment.

In the north, urban groundwater in the Onehunga basalt aquifer shows signs of contamination from stormwater infiltration via soak pits. *E. coli* bacteria and nitrate levels are consistently elevated, as is lead, likely from urban sources. The data record here is not yet long enough for trend analysis, but continued monitoring will improve our understanding of how these conditions are changing over time.

Read the full regional Groundwater Quality report here.

Te Kounga o te Wai o te Awa / River Water Quality

Streams draining into the Manukau Harbour act as a conveyor between land and sea, carrying freshwater from the catchment into the coastal environment. At the same time, they can transport sediment, nutrients, and contaminants washed off the land, linking land use directly to the health of the harbour.

River water quality is monitored monthly at 49 sites across the region, 12 of which are within the Manukau Harbour catchment. Measures of water quality include physical factors such as pH, and temperature, nutrients, bacteria, sediment, clarity, and metals. Dissolved oxygen and temperature are also monitored continuously at selected sites over summer (see the Continuous Monitoring text box on p. 28).

Streams draining native forest have the best water quality, followed by rural streams, with urban streams in the poorest condition.

Regionally, all monitored rural and urban waterways show high *E.coli* bacteria levels indicating faecal contamination. Rural and urban streams also typically have elevated nutrients, higher temperatures, and lower dissolved oxygen, conditions that can stress sensitive species and affect ecosystem health. Urban streams are also commonly impacted by high levels of zinc at concentrations that can harm fish and macroinvertebrates. Visual clarity can be more catchment specific.

These patterns are consistent in the Manukau catchment, with an added, long-standing issue of nitrate contamination in streams in the wider Pukekohe area associated with nitrate contamination in the underlying shallow basalt aquifers. While there are recent indications of improvement at Ngākōroa Stream, trends in the underlying aquifers did not show strong evidence of change, and ongoing inputs of nitrate enriched groundwater will continue to influence these streams.

Puhinui Stream, the most urbanised of the monitored sites within the Manukau catchment, stood out in recent analysis as *E. coli* concentrations were lower than other urban streams, and improving trends were identified across several water quality measures.

In 2022, we expanded stream monitoring in the Manukau catchment to improve representation of land use pressures including eastern rural areas, areas with more native vegetation, and high impact zones such as the growing urban centre of Pukekohe. Preliminary results show eastern rural streams resemble other rural streams regionally and are distinct from the southern rural streams groundwater driven nitrate issues. Monitoring has shown that these eastern streams have softer water (low mineral content) which can make zinc more bioavailable and should be considered in future urban stormwater design. Early findings also show Whangapōuri Stream, south of Pukekohe, is affected by both nitrate laden groundwater baseflow and elevated zinc from upstream urban sources.

Read the full regional River Water Quality report here.

Streams with vegetation along their banks and a range of in-stream features support healthy ecosystems. Vegetation provides shade that keeps water cool, prevents erosion, and reduces pollutant runoff. Pools, riffles, cobbles and logs provide attachment points for algae, shelter for fish, and habitat for insect larvae. Streams containing a range of in-stream habitats, like this section of Waipokapū Stream near Papakura, are generally more resilient and better able to sustain diverse freshwater communities. Photo: Rhian Ingley.

Linking groundwater and streams: understanding nitrate contamination in the Pukekohe area

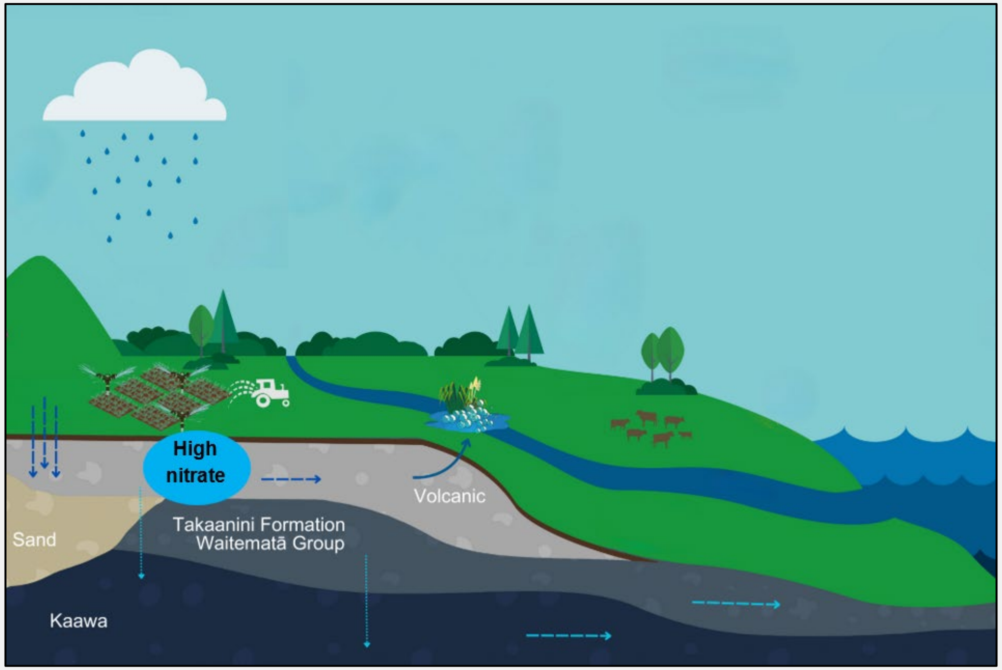
Elevated nitrate concentrations in the Pukekohe and Bombay basalt aquifers have been recognised since the 1970s, often exceeding drinking water guidelines. Springs from these aquifers feed local streams and our long-term monitoring shows some streams also exceed national limits to protect ecosystems from nitrate toxicity. Our monitoring also shows that the ecological state of these streams is degraded. Groundwater aging studies had shown that water could take 16 to 52 years to travel through groundwater and into streams, meaning it could take decades to improve the water quality and meet national limits. However, the aging information didn't cover all aquifers and there was limited knowledge of how and where the groundwater enters each of the streams in the area.

A study by Auckland Council and Earth Sciences New Zealand (formerly GNS Science) has helped us to better understand the interactions between groundwater and surface water and distinguish between processes occurring in two different areas.

The age of the basalt aquifers was confirmed, demonstrating that nitrate-laden water takes about 18 years to move through the Pukekohe aquifer and 36 years for the Bombay aquifer. Three streams (Whangamaire, Whangapouri and Hingaia) are fed by these two aquifer systems and there is little other inflow to dilute nitrate. This means changes on land will take many years to show up as lower stream nitrate levels and highlights the need for long-term planning timeframes to achieve water quality improvements.

Other streams (Ngakoroa, Oira, Mauku and Waitangi) are fed by different local groundwater sources that are naturally low in oxygen. These sources have much lower nitrate concentrations, despite being sourced from areas with land use associated with high nitrate leaching. This is not related to groundwater age, as some are fed by young water (less than 50 years old) and others by older water (over 120 years old). Instead, it is thought that nitrate entering these groundwater systems is being reduced under naturally low-oxygen conditions.

In most streams, the nitrate concentrations gradually declined downstream. This is likely driven by natural in-stream processes such as plant uptake and microbial activity, rather than by dilution, at least during periods of low flow. Despite these decreases, nitrate concentrations near the mouths of Whangamaire and Whangapouri Streams are still above national limits.



A simplified representation of the groundwater system in the wider Pukekohe area, with arrows indicating groundwater flow direction.

Te Hauropi o te Awa / River Ecology

Streams and rivers are important habitats that support a wide range of species, including many types of insects and fish that depend on them throughout their life cycles. They also act as ecological corridors, both within the stream channel and along its margins, enabling fish and insects to move throughout the surrounding catchment. Streams can be impacted by channel modification, pollution, and the loss of vegetation along stream banks. These impacts can reduce plant and animal diversity and weaken ecosystem function and resilience.

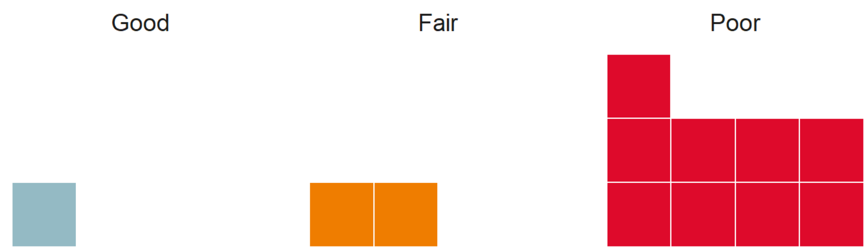
Stream ecological health is monitored at 12 sites that flow into the Manukau Harbour, using a range of methods to assess stream condition. These include sampling macroinvertebrate (aquatic insect) communities, as well as undertaking assessments of stream habitat and riparian vegetation.

Streams in catchments containing a high proportion of native or exotic forest had the best ecological quality, while those in urban catchments were the most degraded.

Freshwater fish monitoring was introduced in 2022. There is not enough data yet to assess the overall state of fish populations in streams within the Manukau Harbour catchment. This will be reported on as more data becomes available in the future.

All but three of the 12 streams located in the Manukau catchment are assessed as having ecological communities that are severely impacted by pollution. The sites that had the highest ecological values are all located near the headwaters of their respective catchments, which are dominated by native forest and low-intensity rural land uses.

The mix of high-intensity agricultural land use in southern parts of the catchment, as well as intensive urban land use in other areas, means that many streams feeding into the harbour show high levels of ecological impact associated with human activities.



Each square represents a site in the freshwater ecology monitoring network within the Manukau Harbour catchment. Most sites have ecological communities strongly affected by pollution.

[Read the full regional River Ecology report here.]

Te Kounga me te Hauropi o te Wai o te Roto / Lake Water Quality and Ecology

While there are no natural lakes within the Manukau Harbour catchment, lakes elsewhere in Tāmaki Makaurau form part of the wider freshwater network and are regularly monitored to track long-term changes in water quality and ecological condition. Two dune lakes on the Āwhitu Peninsula (Lakes Pokorua and Whatihua) are included in this report, due to their close proximity to the catchment boundary and surrounding coastal environment.

Like most lakes across the region, monitored dune lakes on the Āwhitu Peninsula have poor water quality, driven by high nutrient levels.

Lake Pokorua is shallow (around 4 metres deep) and is classed as super-trophic, meaning it contains very high nutrients and green algae. As a result, the lake often experiences algal blooms and has some of the highest dissolved nitrogen levels recorded in lakes across the region. Despite that, the lake supports some of the best native plant communities in Auckland although invasive species are beginning to expand in some deeper areas of the lakebed.

Lake Whatihua is deeper (around 11 metres) but also shows degraded water quality and eutrophic conditions. Nutrient concentrations are high, and during summer the lake develops low oxygen levels near the bottom. This occurs when warmer surface waters sit above cooler bottom waters, limiting mixing and reducing oxygen supply. The lake vegetation is dominated by beds of invasive *Egeria* (oxygen weed) with tall native pond weed persisting in some areas.

The sandy soils around shallow dune lakes such as these do not effectively absorb nutrients from surrounding rural land, allowing them to enter the lakes and accumulate over time. Nutrients stored in lake sediments can then fuel algal growth for decades.

Several key water quality measures (nutrients, dissolved oxygen, phytoplankton) fall below national water quality standards in one or both lakes. This indicates a need for increased attention including catchment management to improve water quality.

Read the full regional Lake Water Quality report here.

He Whakarāpopototanga mō te Wai Māori / Freshwater Summary

Our monitoring of freshwater quantity has demonstrated the increasing extremes with both exceptionally high rainfall and highest recorded stream flows, and drought and lowest stream flows recorded in the last five years. These extremes add to the pressure on water resources and on aquatic ecosystems.

The monitoring in the Manukau Harbour catchment also illustrates how closely connected freshwater systems are and how strongly they respond to our actions. Lower rainfall results in lower groundwater levels but can also increase groundwater use, lowering groundwater levels even further. Land use can also affect groundwater quality such as the high nitrates in Pukekohe aquifers and emerging signs of contamination in urban aquifers. Where affected aquifers feed streams, this affects stream water quality and in turn freshwater fauna.

The growing urban land use in southern areas of the catchment adds other pressures to the freshwater systems, both during the development phase and after. The effects of these pressures can be reduced by using best practice water sensitive design and maintaining and restoring riparian margins and wetlands.

Understanding the connections between land and freshwater systems highlights that managing freshwater is not just about individual sites or issues, but about the whole system. Protecting and improving stream water quality will require both on-the-ground actions and in some cases, patience, allowing for the improvements in groundwater to flow through into streams.

The choices we make – how we use water, manage land, and respond to a changing climate – directly shape the condition of our freshwater environments now and into the future.

At Waitangi Falls near Waiuku, water from a ~19,000 ha catchment reaches the coast. Fed by both rainfall and groundwater, the stream flows through predominantly horticultural and pastoral land, connecting the surrounding environment to the harbour. Photo: Hamish Allen.

Continuous monitoring: tracking environmental change

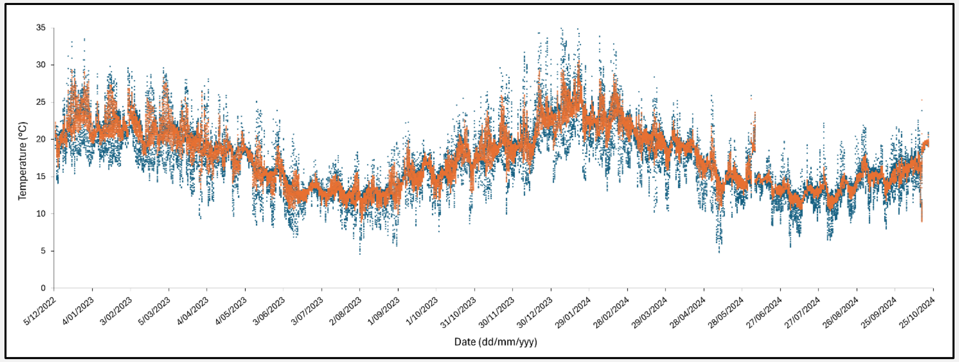
Environmental systems are constantly changing over time. In streams and coastal environments, patterns shift with tides, seasons, and short-term events like storms and heatwaves. Our regular monthly, bimonthly and annual monitoring aims to identify long-term trends but can easily miss short-lived and episodic changes. Continuous (or high frequency) monitoring helps fill this gap, capturing rapid fluctuations that might otherwise go unnoticed.

Two key factors that can change quickly are temperature and dissolved oxygen. Temperature influences where species can live and how ecosystems function, while dissolved oxygen is essential for aquatic life and can become limiting when levels are low. Both are shaped by natural processes, but climate change and increased nutrient and pollutant inputs can make conditions more extreme, placing greater stress on aquatic ecosystems.

In 2021, continuous monitoring of water temperature and dissolved oxygen was expanded to improve regional coverage, with temperature now monitored at five sites in the Manukau Harbour catchment and dissolved oxygen at four. Results show that monthly sampling often misses short-term heat extremes, with several rural and urban streams reaching temperatures high enough to stress sensitive organisms, while all four monitored streams also experience periods of low dissolved oxygen. Riparian restoration, stream naturalisation, and water-sensitive design are important tools for reducing thermal and oxygen stress in streams. In the Puhinui catchment, summer temperature, dissolved oxygen, and aquatic communities are being monitored before and after recent restoration works.

In 2023, temperature monitoring was introduced at several coastal intertidal sites, including Kaitarakihi, Clarks Beach, and Wiroa Island. Intertidal areas are especially vulnerable to heat stress during low tide, when temperatures can change rapidly and reach extremes, as well as during marine heatwaves that keep water temperatures elevated for extended periods.

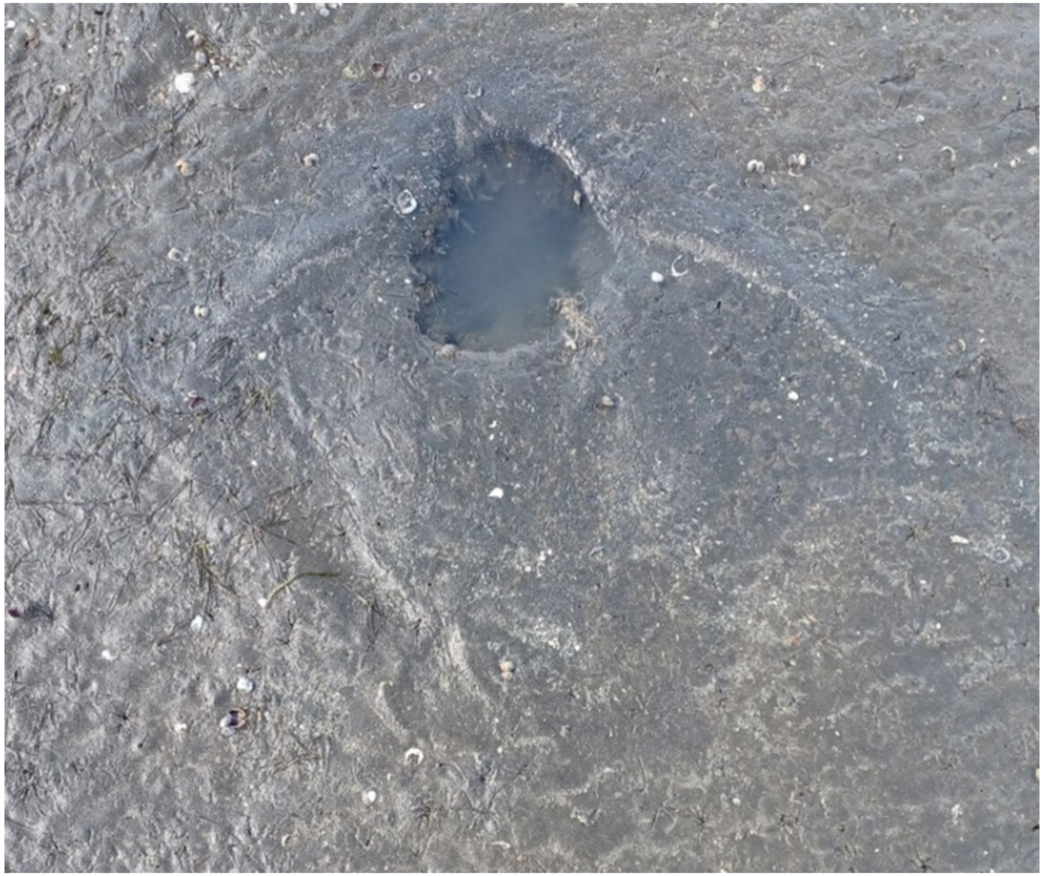
Where possible, continuous monitoring data is paired with ecological monitoring to better understand how changes in temperature and dissolved oxygen affect ecosystems, species, and habitats. This helps identify sensitive areas and where management is most needed to support resilience.



Water and sediment temperature at Clarks Beach from December 2022 to October 2024. Sediment temperature reached a high of 30.9°C in January 2024, and a low of 8.9°C in August 2023.

Te Takutai Moana / Coasts

The Manukau Harbour is one of Auckland's defining waterways, spanning shallow and deep channels, intertidal flats, and tidal inlets, forming a dynamic and ever-changing ecosystem. It supports abundant fish, birds, and invertebrates and provides important ecological, cultural, recreational, and economic values for communities along its shoreline and beyond. But the harbour faces many pressures. Urbanisation, industrial activity, and nutrient and sediment runoff, affect water quality, habitats, and the species that rely on them. While many indicators are currently stable, longer-term trends show that large-scale wastewater treatment plant upgrades in the early 2000s led to measurable ecological and water quality improvements in some parts of the harbour. Understanding the harbour's current condition, its ecological interactions, and how it is changing over time, is essential for protecting biodiversity, sustaining human connections, and ensuring it thrives for future generations.



Whai (stingray) reshape the seafloor as they forage, blasting jets of water through their gills to uncover buried prey. Once exposed, shells are crushed with powerful flat teeth to access the soft tissue inside, leaving behind distinctive pits that mark their feeding activity across the sediment. Whai are common across the Manukau, including at Ihumātao where this image was captured. Photo: Tarn Drylie.

Te Kounga o te Wai Takutai / Coastal Water Quality

The quality of water in the Manukau Harbour is shaped by a range of natural processes and varies across tides, seasons, and longer time scales. It is influenced by climate and weather, biological and chemical processes, the physical form of the coast and geology of its catchment. The large volume of tidal flushing plays an important role, providing regular water exchange and renewal that has undoubtedly benefited the harbour. Layered on top of these natural dynamics are human influences. Coastal discharges carrying fine sediment, nutrients and other contaminants into the harbour can have both short- and long-term effects.

Coastal water quality is monitored monthly at eight sites across the Manukau. Monitoring assesses physical parameters such as temperature, salinity, dissolved oxygen, nutrients, and suspended sediments, providing a picture of current conditions and how they change over time.

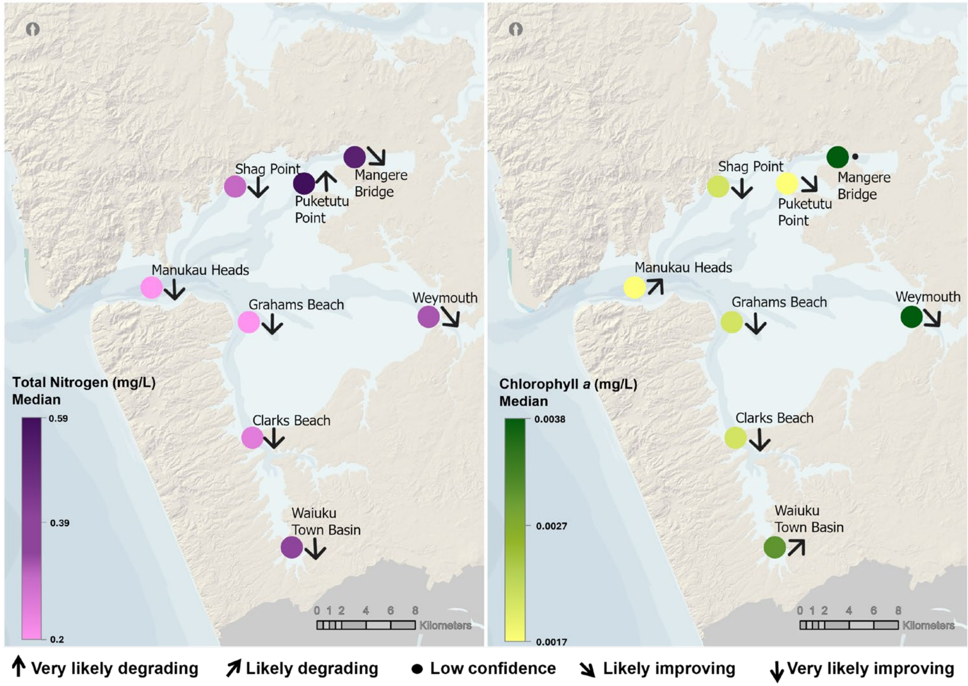
Overall, conditions have generally improved since the early 2000s, following upgrades to the Māngere wastewater treatment plant, with more stable nutrient levels and clearer water.

While water quality has improved overall, gains are uneven across the harbour. Inner harbour areas remain under pressure from elevated nutrient levels and continue to experience ongoing water quality issues.

These pressures are most evident in areas such as Puketutu Point, Weymouth, Waiuku Town Basin, and Māngere Bridge. Sites at these locations experience frequent exceedances of nutrient guidelines and have higher levels of chlorophyll-*a*, indicating more frequent phytoplankton (microalgae) blooms. This is likely due to stronger land-based influences and lower dilution from the open sea.

Phytoplankton appeared to play a central role in shaping water quality in the Manukau, particularly in the harbour inlets and tidal creeks. Phytoplankton grow quickly in warm, nutrient-rich water. When phytoplankton levels are high, the water is less clear and by photosynthesising they increase oxygen and raise pH. As temperatures cool, phytoplankton die and break down, using up oxygen, lowering pH and releasing carbon dioxide and decaying organic matter into the water.

Long-term trends show gradual improvements in nutrients and chlorophyll-*a* at most sites, although changes are slow. Some areas, such as Puketutu Point, may be worsening, potentially linked to wastewater overflows during heavy rainfalls in 2023-2024. Overall, nutrient enrichment remains a key issue, highlighting the need for continued monitoring and management to protect harbour health.



Total nitrogen (left) and chlorophyll-*a* (right) concentrations at coastal water quality sites in the Manukau Harbour based on data collected from 2020 to 2024. Higher total nitrogen and chlorophyll-*a* levels in harbour inlets and tidal creeks indicate poorer water quality in these areas, likely influenced by land-based coastal discharges. Long-term trends suggest gradual improvements in nutrients and chlorophyll-*a* at many sites, although progress has been slow and not always consistent.

[Read the full regional Coastal and Estuarine Water Quality report here.]

Taken en route to the Clarks Beach water quality monitoring site, this image shows a large sediment plume generated by heavy rainfall the previous day. These plumes reflect the transport of land-derived sediments into coastal waters. Water clarity at Clarks Beach during this sampling event was around three times lower than in the preceding and following months. Reduced water clarity limits light penetration, affecting ecological processes and coastal ecosystem health. Photo: Julia O'Grady.

Ngā Matū Taoke o te Parakiwai / Sediment Contaminants

Marine sediments can act as a sink for a range of contaminants. At high levels, metals, nutrients, and organic compounds can harm coastal ecosystems, reducing the number and diversity of animals living there and disrupting how these systems function. Entering the marine environment through pathways such as streams, stormwater, and industrial discharges, contaminant levels in sediments provide a useful indicator of land use pressures and overall ecosystem health.

Marine sediment contaminant monitoring began in the Manukau in 1998 and is now undertaken at 27 intertidal sites. Monitoring focuses on stormwater-related metals (e.g., copper, lead and zinc), with concentrations assessed against sediment quality guidelines indicating potential ecological effects. Sites are classified using a traffic light system: red (elevated concentrations with likely effects), amber (moderate concentrations with possible effects), and green (low concentrations with minimal or no effects).

Overall, metal contamination in the harbour is low, with most sites below levels where ecological impacts are expected. This likely reflects strong tidal flushing, a large, well-mixed water volume, and a relatively small urban catchment.

Sites that have higher contaminant levels are in the Māngere Inlet, in the muddy, low energy upper reaches of the harbour. Here, elevated zinc places two sites (Harania and Anns Creek) in the amber range.

Site	Year																
	1998	1999	2001	2003	2005	2007	2009	2010	2011	2013	2015	2016	2017	2018	2019	2021	2024
Anns Creek	🔴🟠🔴	🔴🟠🔴	🔴🟠🔴	🔴🟠🔴	🟠🟠🔴	🟠🟢🟠	🟠🟢🟠		🟠🟢🔴	🟢🟢🟠		🟢🟢🟠		🟢🟢🔴		🟢🟢🟠	🟢🟢🟠
Māngere Cemetery	🟠🟠🟠	🟠🟠🟠	🔴🟠🔴	🟠🟠🟠	🟠🟢🟠	🟠🟢🟠	🟢🟢🟢		🟠🟢🟠	🟢🟢🟢		🟢🟢🟢		🟢🟢🟢		🟢🟢🟢	🟢🟢🟢
Tararata					🟠🟢🟠			🟢🟢🟠			🟢🟢🟢		🟢🟢🟠		🟢🟢🟢	🟢🟢🟢	🟢🟢🟢
Harania					🟠🟢🟢			🟢🟢🟠			🟢🟢🟠		🟢🟢🟠		🟢🟢🟠	🟢🟢🟠	

History of state for sites in the Māngere Inlet. Each set of dots represents sediment concentrations of copper (left), lead (centre), and zinc (right) for a given year. Colour indicates contamination level: green = low, amber = moderate, and red = high. The table shows contaminant levels declining over time, from consistently elevated concentrations in the late 1990s, to largely low levels today.

The Māngere Inlet has shown elevated levels of several metals (particularly zinc) since monitoring began, reflecting its highly developed catchment and long history of commercial and industrial activity. Contaminant levels here are continuing to show improvement. Several sites have shifted from amber or red to green over time, with declining trends also observed for copper and lead. These ongoing decreases may be due to improved industrial site, stormwater, and waste management in the surrounding catchment. In contrast, several sites in the Pāhurehure Inlet are showing increasing zinc levels. However, concentrations remain low, and only a small number of sites show increases at a rate considered meaningful, indicating that while some increases are occurring, they are not yet widespread or consistent.

Read the full regional Marine Sediment Contaminants report here.

Te Hauropi o te Whanga / Harbour Ecology

Estuaries are home to a high diversity of animals. Often hidden in the sand and mud, these animals play important roles in the local estuarine environment, while also fuelling wider ecosystems as a food source for fish and birds. Estuaries are subject to multiple pressures that can interact and build over time. Pollutants and excess sediment can reduce ecological health, affecting estuarine function and limiting ecosystem services such as climate regulation, food production, nutrient cycling, and cultural and recreational values.

Harbour ecology monitoring looks at intertidal site characteristics and the communities of animals living in the sediment. We focus on sediment-dwelling species because they play an important role in estuary health and are sensitive to human impacts.

Frequently monitored sites are located at Clarks Beach and Auckland Airport, while additional sites across the main body of the harbour are surveyed on a rotational basis. Ecology data are also collected from tidal creek sites where contaminant monitoring occurs. Each site is assessed using ecological models that provide an overall measure of ecosystem health, with scores ranging from poor to excellent.

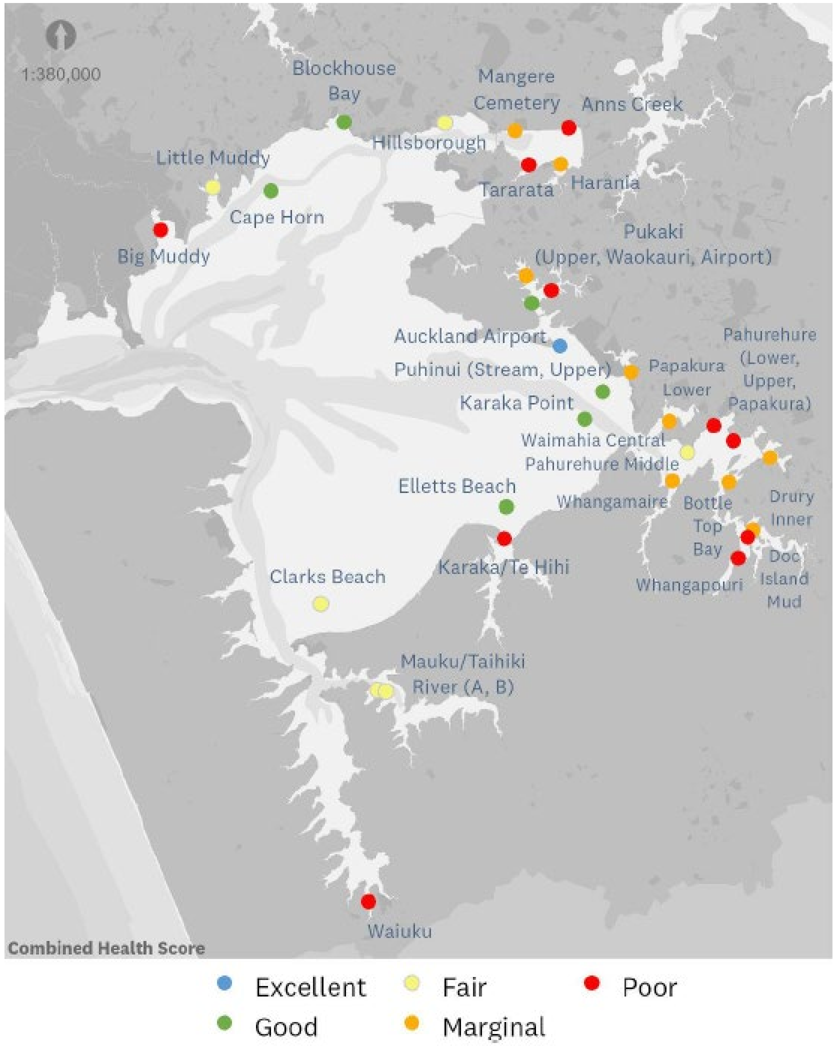
The Taihiki River tidal flats are dotted with patches of dense mud crab burrows. Mud crabs act as 'ecosystem engineers', reshaping their environment in ways that alter habitat conditions and influence other species and ecological processes. As they dig, they quietly turn and aerate the mud, helping circulate oxygen and cycle nutrients that supports life in the estuary. Photo: Hamish Allen.

The ecological health of the Manukau Harbour tells a mixed story: sandflat sites in the body of the harbour were mostly rated 'Good' or 'Excellent', while tidal creek sites were more often 'Marginal' or 'Poor'.

Overall, results show a clear pattern consistent with other Auckland harbours and strongly reflect the influence of land-based pressures. Fine sediment (mud) is the main driver of ecological condition. Lower mud levels are associated with healthier sandflat communities, while higher mud content, typically found in sheltered low-energy creeks and inlets, is linked to poorer ecological health. These sheltered areas receive more direct runoff from surrounding catchments, where urban and rural land uses contribute sediment and contaminants.

The Auckland Airport site, located on Wiroa Island, stands out as the only site across Auckland's major harbours with an 'excellent' ecological health rating. Its exposed location on an open sandflat, far from major freshwater inflows, means it experiences low contaminant inputs and strong tidal flushing.

While ecological health has generally improved since the early 2000s and the upgrades to the Māngere wastewater treatment plant, more recently there has been some variability in the changes we see across the harbour. This includes some very recent increases in sediment organic content, which will continue to be monitored to see if these trends persist. Some sites in the Māngere Inlet, however, show gradual improvement, indicating slow but ongoing recovery.



Combined Health Scores for Manukau Harbour monitoring sites. Scores describe the overall health of a site based on the composition of animals living in the sediment.

Read the full regional Harbour and Estuary Ecology report here.

The marine ecology monitoring site at Clarks Beach is located over 1 km from the shore on extensive tidal flats, an ecosystem typical across much of the harbour. Monitoring here has been underway since 1987, providing a long-term dataset that is incredibly valuable for tracking ecological change over time, including annual variability and broader climate-driven trends. Photo: Tarn Drylie.

Te Hauropi o te Pūkawa / Reef Ecology

Between land and sea, intertidal reefs are exposed to air, sunlight, strong wave action, and changing salinity and temperature. Species living here must cope with variable conditions and often live close to their limits. This makes these environments particularly sensitive to additional human pressures, including coastal disturbance and overharvesting of reef species.

In 2021, rocky reef monitoring sites were establshed at four west coast locations – two sites on the harbours northern shoreline at Kaitarakihi and Huia, as well as exposed coastal sites at Te Henga and Piha. Reef monitoring tracks the numbers and diversity of animals and seaweeds living on intertidal reefs, and helps assess ecosystem health and the impacts of threats such as invasive species, land-based pollution and climate change.

Huia supports a diverse animal community on its mostly sediment free, rugged reef, while seagrass patches within thick silt at Kaitarakihi may signal early ecological and habitat change linked to ongoing sediment build-up.

The Huia site features a steep and jagged intertidal reef with exposed rock and very little sediment. Its complex and varied substrate provides shelter and surfaces for a wide range of marine animals, including several species that are uncommon at other west coast sites such as cat’s eye snails, spotted black topshells, oyster borers, and snakeskin chitons.

The Kaitarakihi site is located on a broad, gently sloping platform west of Kaitarakihi Beach. Sediment build up in the mid- and low-shore zones has allowed seagrass patches to establish. Overall, the site supports a lower diversity of animals and algae.

Read the full regional Intertidal Reef Ecology report here.

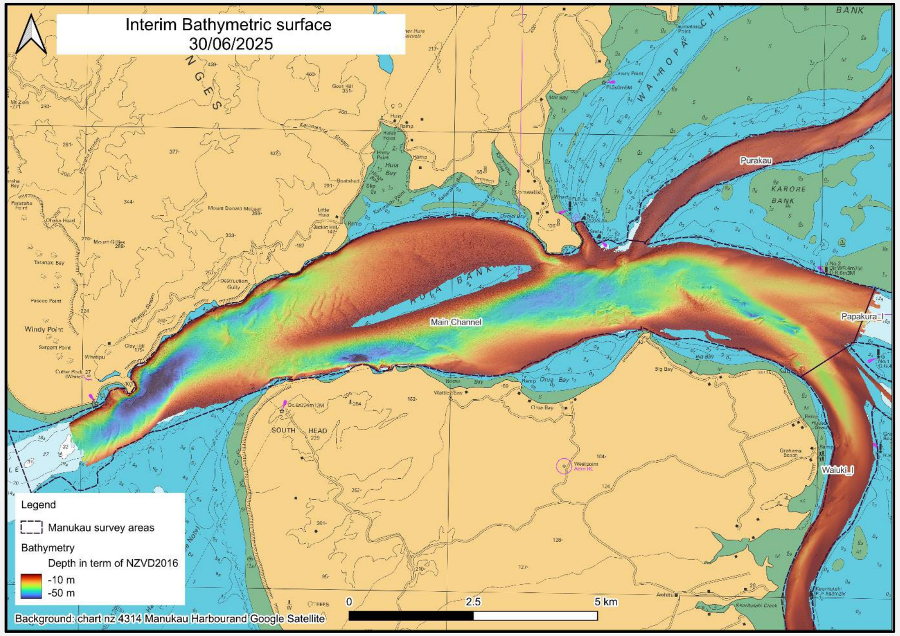
Mapping the underwater habitats of the Manukau

Beneath the surface of the Manukau lies a largely unseen world. While much of the harbour is intertidal, subtidal areas extend from shallow zones through to channels and areas near the harbour entrance that can reach over 45 metres in depth. These environments are often characterised by strong currents and steep slopes, which help shape the communities found there.

Subtidal environments can support diverse and important habitats, including shellfish beds, kelp forests, sponge gardens, and seagrass meadows. Although out of sight, they are not beyond the reach of human pressures: sedimentation, climate change, invasive species, and land-based pollutants can all impact these fragile ecosystems. Mapping where these habitats occur, and the species and communities they support, allows us to assess marine health, identify rare or significant ecological areas, and establish a baseline for monitoring future change.

To explore the harbour's subtidal areas, we must first understand the shape and nature of the seafloor. Surveys have been undertaken to create detailed maps capturing features such as texture, slope, and roughness. Experts then interpret these maps to identify potential ecological communities, followed by targeted underwater video surveys that fully characterise the species present. Beyond mapping habitats, video footage can also provide additional value, including detection of invasive species and monitoring of nuisance algae. These deeper surveys will be complemented by a planned aerial survey of the harbour's shallow areas, which will map intertidal surface elevation and coastal features.

Through this integrated approach, a clearer picture of the species, habitats, and ecological communities that call the Manukau Harbour home will be revealed, providing the information needed to guide their future protection and management.



Map of seafloor depth in the main harbour channels, based on survey data collected in 2025.

He Whakarāpopototanga mō te Takutai / Coastal Summary

Environmental condition in the Manukau Harbour is shaped by a combination of strong natural forces and ongoing human influence. Fine sediment (mud) is a key driver of change, altering habitats and the communities of animals that live within them. Its effects can build gradually over time but can also intensify rapidly during heavy rainfall and storm events, when large pulses of sediment are washed into the harbour. Sheltered, low-energy environments such as tidal creeks and inner harbour inlets often bear the brunt of these impacts, where fine sediments readily settle and accumulate. Compared with cleaner sandflat habitats, muddier areas generally support fewer and less diverse animals and are more likely to trap and retain contaminants. Sediment, however, is only one part of the story. Other catchment-derived pressures are also evident in parts of the harbour, including excess nutrients in the water that promote microalgal growth, reducing water clarity and altering ecological processes.

Many of the marine monitoring programmes in the Manukau show broadly stable patterns over time, with little clear evidence of overall improvement or decline. While this stability is encouraging given growing pressures from urbanisation across the catchment, it should not be interpreted as evidence of uniformly healthy conditions.

In some areas, conditions appear to have stabilised in a degraded state, suggesting that although widespread decline is not occurring, meaningful recovery is still limited.

The intertidal reef west of Kaitarakihi Beach forms a broad, gently sloping platform in a sheltered position close to the harbour entrance. The mid and low-shore zones are dominated by fine sediment, with scattered patches of seagrass present. The reef at Kaitarakihi appears to be undergoing gradual habitat change due to ongoing sediment accumulation. Photo: Hamish Allen.

Whakarāpopototanga / Summary

This report brings together findings from State of the Environment monitoring across the Manukau Harbour and its catchment, providing an integrated picture of environmental condition, key trends, and the pressures shaping air, land, freshwater, and marine environments.

Environmental condition is highly variable, reflecting a range of different influences. Air quality is generally better than the Auckland average, although industrial areas likely have localised impacts. Land cover is dominated by exotic grassland, with gradual urban expansion reshaping parts of the catchment. Impacts associated with intensive agricultural and horticultural land use are evident, including soil compaction, nutrient enrichment, and elevated nitrate levels in some groundwater and stream systems. Native forest areas consistently support the highest terrestrial biodiversity and stream health, while urban streams and many of the remaining wetlands show signs of degradation. In the harbour itself, water quality has improved overall, but inner harbour areas continue to experience elevated nutrient levels. Ecological condition of the harbour is highly variable, with sandflat habitats generally in good condition, while tidal creek environments are more degraded. Although metal contamination remains low, evidence of localised sediment accumulation and habitat change at some sites indicates the continuing influence of land-based inputs on coastal ecosystems.

Much of the current pattern mirrors findings from the previous synthesis. This reflects the typically gradual nature of change in large and complex systems such as the Manukau, where shifts in environmental condition often unfold over long timeframes rather than occurring rapidly. The legacy of past land use continues to influence present-day conditions. This is highlighted by groundwater travel times, which demonstrate how changes we make on land today can take many years to be reflected in the wider environment. Since the last synthesis, the most notable changes have been in land cover and land use, with small pockets of change concentrated in the east and south-east of the catchment, particularly around Drury, where areas of exotic grassland have been converted to urban land use.

Some stability is encouraging given the growing pressures on the harbour and catchment. However, stability does not always indicate healthy environmental condition. In some areas, it instead reflects persistently degraded states, reinforcing that there is still substantial scope for improvement and recovery.

Strong land-water linkages continue to shape environmental condition around the harbour. This connectivity provides a pathway through which catchment pressures such as urban expansion, intensive agricultural and horticultural land use, and nutrient and sediment inputs, influence ecological condition within the harbour.

Environmental pressures remain evident across the harbour and catchment. Several issues identified in the previous synthesis report continue to be reflected in current monitoring. While many of the challenges facing the Manukau are shared across Auckland, as highlighted in the regional [State of the Environment] report, the harbour also experiences some localised and distinct impacts. Future climate change and more frequent extreme weather events are likely to intensify these pressures by increasing sediment and nutrient inputs and placing additional stress on environmental systems. In isolation, many individual pressures may be within the harbour's capacity to absorb. However, because environments are closely connected, impacts can move through land, freshwater, and coastal systems, accumulating and interacting over time to produce effects far greater than any single driver alone.

The harbour is resilient, but its long-term condition will ultimately depend on effective catchment management. The Manukau remains a highly productive ecosystem supporting a wide range of ecological values. Strong connections between land and sea mean it responds to changes across the catchment. This close coupling creates both risk and opportunity: land-based pressures can strongly affect coastal environments, but improvements in catchment management can also support recovery. This underlines the importance of integrated catchment management in shaping the future health of the harbour, alongside continued monitoring to build on existing datasets and improve our understanding of the effectiveness of management actions.

Viewed from above, the Manukau Harbour sits within a diverse catchment where natural processes and human activities interact to shape environmental conditions. Long-term monitoring helps improve our understanding of how the harbour responds to these influences and how it changes over time. Image: Eagle Technology, NZ Imagery Basemap 2026.

Recommended citation

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Cover image: Ōmanawanui Track, Waitākere Ranges. Photograph by Hamish Allen

Image above: Foreshore near Te Ara i Tautahi / Ambury Regional Park, Māngere Bridge. Photograph by Stephanie Creagh

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