

Seachange

HAURAKI GULF MARINE SPATIAL PLAN

COASTAL WATER QUALITY

Overview

New Zealanders love spending time in and around the sea. We enjoy swimming in sparkling waters, relaxing at the beach, fishing off the rocks, or sailing around the many bays and islands.

A crucial part of any coastal activity is the quality of the water. High water quality is essential for coastal activities such as fishing, shellfish gathering and marine farming, traditional uses, swimming and other water sports, and tourism.

Our coastal plants and animals need good water quality if they are to survive. We need to maintain high water quality and restore water quality where it has been lost.

Coastal water quality can be affected by a number of land and sea activities. These include stormwater discharges, run off from urban areas, farmland and forestry, flows from streams and rivers, seepage from septic tanks, and the discharge of sewage and rubbish from boats.¹ As a result of these activities, contaminants such as bacteria, sediment, nutrients or heavy metals can end up in coastal water.

Monitoring water quality can tell us a lot about how the ecology of estuaries and the coast may change. Different aspects of water quality are measured depending on whether it's being assessed for swimming and contact recreation, or for the general health of the environment.

Contact recreation water quality on the coast

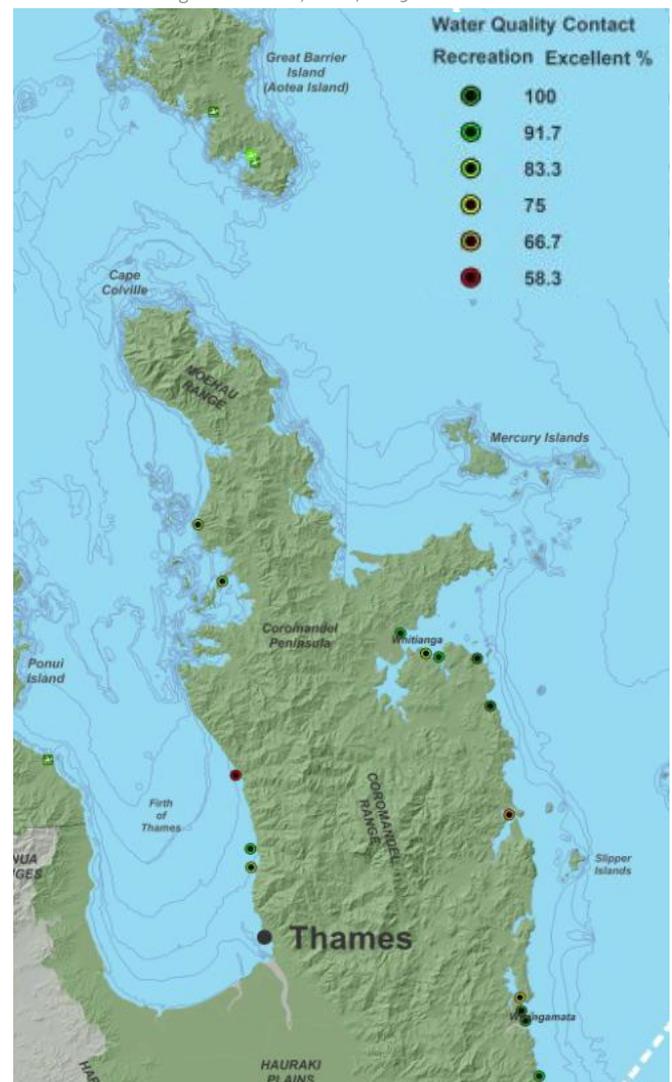
Auckland Council and Waikato Regional Council monitor a representative sample of swimming beaches in their regions to check how good the water quality is for contact recreation such as swimming, surfing and waterskiing. The indicator for safe water quality is Enterococci, a faecal bacteria easily

measured in sea water. Guidelines for monitoring are set by the Ministry for Health and Ministry for the Environment.

Waikato region beaches have excellent water quality, with only a small number of samples coming back as unsatisfactory.

Map 1: Coromandel coastal water quality

Source: Waikato Regional Council, 2008/2009 data



¹ Taken from Waikato State of the Environment Report: Coastal Water Quality. Coastal Factsheet 15.

Auckland region monitors 43 sites in the Hauraki Gulf. Three sites have a permanent warning due to ongoing water quality concerns: Little Oneroa on Waiheke, Wairau Outlet at Milford and Cox's Bay in the Waitemata Harbour. Eleven sites are consistently excellent and these are on the open coast north of Auckland (Wenderholm, Tawharanui, Goat Island and Omaha) and south of the city (Omana and Maraetai). The remaining 29 fluctuate in their water quality and are sampled weekly over summer. Water quality is worse after rainfall, as stormwater is the main source of contamination. The SafeSwim results for contact recreation water quality for the 2012/13 season in Auckland are shown in map 2.

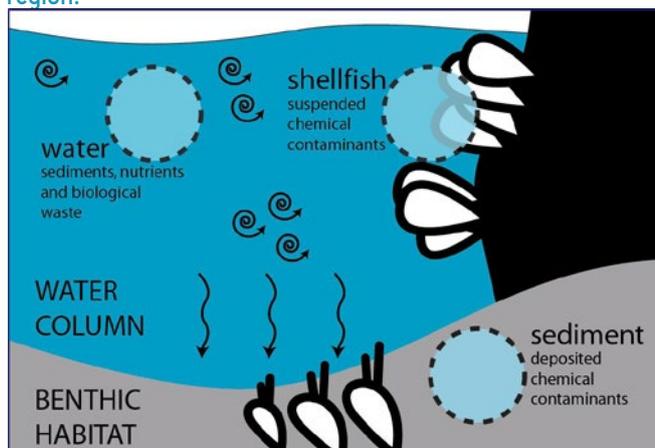
Water quality monitoring

To monitor coastal water quality and assess its impact on the environment, a range of indicators are used. These indicators can be the sediments, nutrients and biological matter in the water column, chemical contaminants in shellfish, and heavy metal and chemical contaminants in sediment on the bottom of the sea floor.

Shellfish are filter feeders so eat contaminants found in water. Sediment can bind to chemical contaminants and keep them in the seafloor. Sediment can also smother marine life. For this reason, shellfish and sediment are often monitored as well as water to build a picture of overall water quality and its effect on the environment.

Water quality is generally measured at coastal sites, which are both easier to access and reflect where people use the Hauraki Gulf. The trend for both Auckland and Waikato regions is that the further from the coast/land you go, the better the water quality. This is because in open water there is more dilution and it is further from freshwater sources of contaminants.

Figure 1: Water quality measures used in the Auckland region.



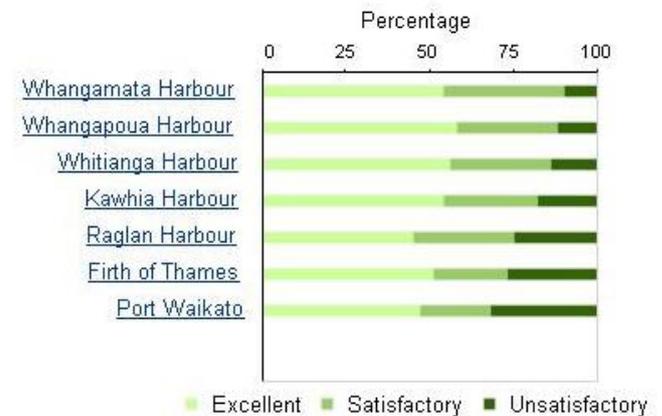
Source: Walker, J and Vaughan, M (2013). Marine water quality annual report: 2011. Auckland Council technical report, TR2013/031

Waikato

In the Waikato there are a range of indicators used to assess water quality on the coasts and estuaries. These indicators are dissolved oxygen (essential for marine life to live), the nutrients nitrogen and phosphorus, pH (acidity of the water), chlorophyll a (phytoplankton which shellfish feed on), and turbidity or suspended sediment (gives an indication of sediment in the water column). Together these tell us how good the water quality is for marine life – the ecology.

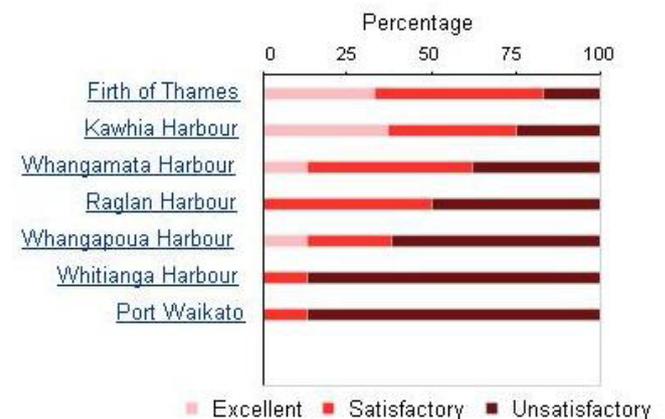
This graph shows the percentage of the number of samples taken that met different levels of water quality. The samples were taken between 1999 and 2011. The Hauraki Gulf harbours (Whangamata, Whangapoua, Whitianga, Firth of Thames) were sampled in different years and show that the water quality is satisfactory or better for marine life more than 75 per cent of the time.

Figure 2: Ecological water quality in Waikato region estuaries. Source: Waikato Regional Council



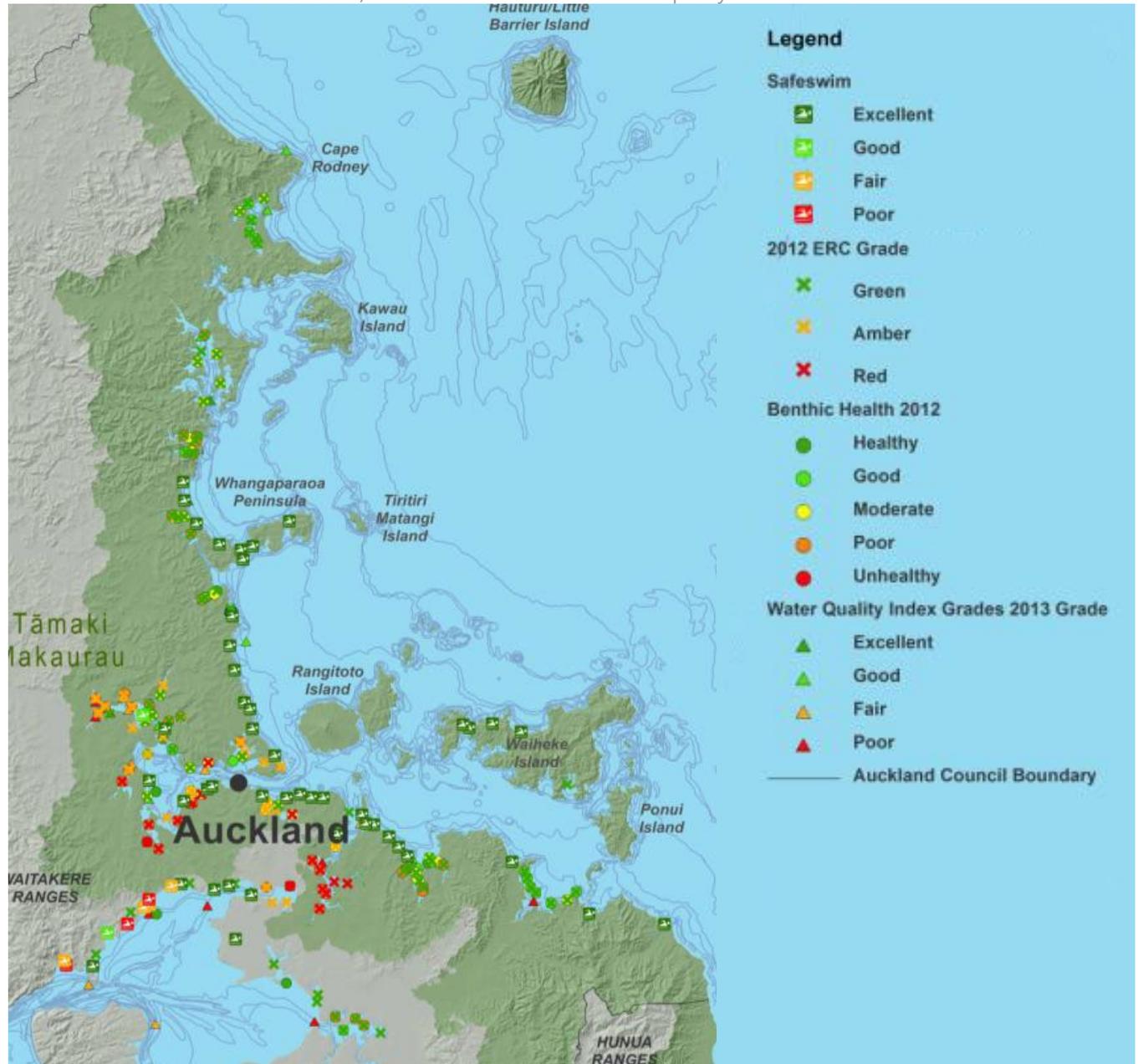
For shellfish gathering, water quality is satisfactory or better more than 50 per cent of the time in the Firth of Thames and Whangamata Harbour. In Whitianga Harbour, water quality for shellfish gathering is satisfactory less than 25 per cent of the time.

Figure 3: Shellfish gathering water quality in Waikato region estuaries. Source: Waikato Regional Council



Map 2: Auckland coastal water quality

Source: Auckland Council. Data for ERC, Benthic Health Model and water quality from 2012.



Auckland

In Auckland, an overall grade on water quality is created by combining the individual grades for the main water quality measures at each water quality monitoring site.² The measures used are total suspended solids (sediment and chlorophyll a), nitrogen, phosphorus and faecal coliforms.

Open coastal sites (Ti Point, Mahurangi Heads, Orewa and Browns Bay) had the highest average rank, reflecting a high degree of flushing by the tides and distance from freshwater sources of contaminants. In contrast, sites in the Upper Waitemata Harbour, inner Manukau and upper Tamaki were worst. There is a strong relationship between the level of salinity at a site and water quality which supports the hypothesis that the greater the amount of freshwater input at a site the lower the overall water quality.

Sediment

Sediment enters the marine environment suspended in freshwater and run off from the land. Seventy per cent of the sediment in the Hauraki Gulf comes from the Waihou and Piako rivers. Further north, the main sources of sediment entering the Gulf are the Mahurangi Harbour, Upper Waitemata Harbour and the Wairoa River near Clevedon. The overall trend in the Auckland region is for decreasing amounts of sediment suspended in seawater.³ This is thought to be due to measures put in place by the Auckland Council to reduce run off from land.

Sediment that has settled on the bottom of the coastal environment is monitored because contaminants like heavy metal can bind to it, smothering marine life or altering the proportion of sand to mud and changing which species prefer to live there.

^{2, 3} Scarsbrook, M. 2008. Saline water quality state and trends in the Auckland region. Prepared by National Institute of Water and Atmospheric Research Limited for Auckland Regional Council. Regional Council Technical Report 2008/005.

Auckland

Toxic metal and organic contaminants found in sediment are causing localised effects in Auckland estuaries and in the southern Firth of Thames.⁴ The areas where contaminants are probably affecting marine life are Meola Creek and Motions Creek in the Waitemata Harbour.

Auckland Council monitors the levels of heavy metals and other contaminants found in sediment on the sea floor. There are two ways these levels are reported (see map 2). The environment response criteria (ERC) traffic light system assigns a colour for different levels of heavy metals depending on whether the amount found is likely to adversely impact on marine life.⁵

| | ERC (ARC 2004) | | |
|----------|----------------|-------------|--------|
| | GREEN | AMBER | RED |
| Copper | <19 | 19-34 | >34 |
| Lead | <30 | 30-50 | >50 |
| Zinc | <124 | 124-150 | >150 |
| PC 1.500 | <.782 | 0.782-1.540 | >1.540 |

- ERC Green reflects a relatively low level of impact based on an individual contaminant.
- ERC Amber reflects contamination above a level at which adverse effects on the ecology at the bottom of the sea (benthic ecology) may begin to show.
- ERC Red reflects conditions where significant degradation has already occurred.

The ERC guidelines assess the effects of individual contaminants. The benthic health model metals (BHMMetals) was developed for Auckland marine environments to provide a measure of the combined effects of copper, lead and zinc found together on marine life. The benthic health groupings are as follows:

1. = excellent
2. = good
3. = moderate
4. = poor
5. = unhealthy.

Anything above 3 is considered critical.

The worst areas for benthic health and water quality are in the Waitemata Harbour and Tamaki Estuary. Both benthic health and water quality are good to excellent from the East Coast Bays up to Cape Rodney and in the Whitford and Clevedon areas.⁶

Waikato

In the Waikato region, a range of heavy metals and trace elements are monitored for at sites in the Firth of Thames and Tairua.⁷ The risk of sediment-dwelling organisms caused by concentrations of trace elements and/or organic compounds in the Firth of Thames is generally low. However, concentrations of arsenic, zinc, and particularly mercury were found to exist at moderate concentrations that may have an impact on aquatic life. Mercury is high due to seepage from old mine tailings. The eastern side of the Firth of Thames had higher levels than the western side, though these were still at levels unlikely to have a toxic effect on marine life. In Tairua the concentrations of heavy metals and trace elements are low and unlikely to have an effect on marine life.

Mud to sand ratio

Increases in the amount of mud (fine sediment) to sand ratio can affect the mix of species found living at a site. Changes in the mix of species or in the amount of a single species have been observed at one site each in Orewa, Puhoi, Waikopua and Waiwera and four sites in Okura. These changes are consistent with an increase in fine sediment which has been recorded. In the Firth of Thames, mud has increased as a proportion of sediment but there has been no significant change in the species found there.⁸

4,8 Tikipa Moana - Hauraki Gulf State of the Environment Report 2011

5 Moores, J., Cameron, M., Harper, S., and Batstone, C (2013). Urban planning that sustains waterbodies: southern RUB case study. Prepared by NIWA and Auckland Council Research, Investigations and Monitoring Unit. Auckland Council working report, WR2013/006

6 Auckland Council, 2013

7 <http://www.waikatoregion.govt.nz/Environment/Environmental-information/Environmental-indicators/Coasts/Coastal-water-quality/c012a-report/>