

Coastal Water Quality

Coastal water quality is a valuable resource, which is important to Northland's inhabitants and the many diverse forms of marine life that inhabit our coastline. Coastal water quality is influenced by inputs from rivers and streams, urban and rural run off and direct discharges into the coast.

As human land use and urban development intensifies, marine water quality will come under increasing pressure. The threat to coastal water quality is likely to be worse in semi-enclosed coastal water bodies, such as estuaries and harbours, where there is less exchange of water with the open coast.

Northland's coastline includes 17 major harbours, many smaller estuaries and extensive stretches of rocky and sandy open coast. The Northland Regional Council carries out monitoring of the region's coastal environment to record the state of this resource, the effects of human activity, to increase awareness of water quality issues, inform decision making and detect changes over time.

Maintaining and protecting coastal water quality is important for:

- Healthy coastal and marine ecosystems;
- Recreational uses such as swimming, sailing, water skiing and scuba diving;
- Fishing, shellfish gathering and aquaculture; and
- Tourism.



Whangaroa Harbour

Harbour Water Quality Monitoring Programme

In 2009-2010, the Council added the Kaipara and Hokianga Harbours to its routine water quality monitoring programme, which brings the total number of harbours monitored across Northland to five.

In 2009-2010, the Council undertook routine water quality testing at 16 sites in the Whāngārei, Bay of Islands and Hokianga Harbours, and nine sites in the Whangaroa and Kaipara Harbours. Monitoring sites in these harbours have been selected to capture the main freshwater inputs into the systems, and to assess water quality across the harbour.

Water samples were analysed for physical properties such as temperature, salinity and turbidity – how clear the water looks – and for chemical parameters such as nutrients (ammonia, phosphorus and nitrogen).

Bacteria present in the water were measured using *Enterococci*, faecal coliforms and *E. coli*, which are indicators of faecal contamination.

The New Zealand Marine Bathing Study showed that *Enterococci* are the indicator most closely correlated with health effects in New Zealand marine waters. Faecal coliforms are not as closely related to human health effects however they are useful in environmental circumstances, such as brackish or estuarine environments, where levels of *Enterococci* may occur naturally in mangrove forests.

Coastal Water Quality performance targets

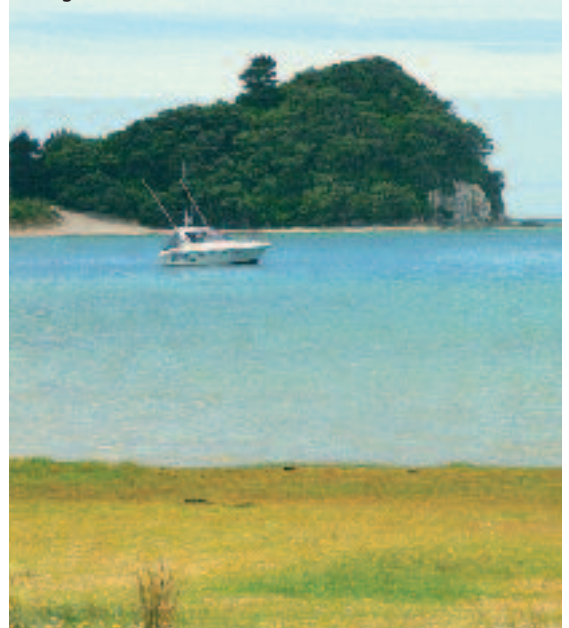
Continue to implement and improve a prioritised State of the Environment (SoE) monitoring programme and monitor compliance with, and the effects of, the exercise of resource consents and Regional Plans by:

- Monitor water and sediment quality in Northland on a prioritised basis.
- Annual % compliance for priority harbour waters with appropriate guideline values.
- Undertake a prioritised estuary health monitoring programme.
- Inspecting significant coastal structures and works, marine farms and carrying out surveys of the coast where there is sand mining activity (98% achieved).

Key points 2009-2010

- Sites in the Kaipara, Hokianga and Bay of Islands harbours achieved 100% compliance with the dissolved oxygen guidelines.
- Kaipara, Hokianga, Bay of Islands and Whāngārei harbours achieved more than 95% compliance with MfE *Enterococci* guidelines.
- Whangaroa Harbour only achieved 51% compliance with MfE faecal coliform guidelines.
- In the Whāngārei Harbour, compliance with the coastal water quality standards for ammonia and phosphorus was less than 53% and in the Kaipara harbour, compliance was 45% for ammonia.

Mangawhai Harbour.



Freshwater inputs from rivers are tested for the indicator bacteria *Escherichia coli* (*E. coli*). This bacterium indicates faecal pollution and scientific studies have shown that where *E. coli* is present, we can assume there are pathogens in the water. Water samples were tested for *E. coli* in harbours with large freshwater inputs. In the Hokianga, shellfish samples were also tested for *E. coli* at four sites.

Results 2009-2010

Results from the monitoring programme are assessed against the water quality standards outlined in the Northland Regional Coastal Plan (RCP), the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC guidelines) and the Ministry for the Environment (MfE) Microbiological Water Quality Guidelines as follows:

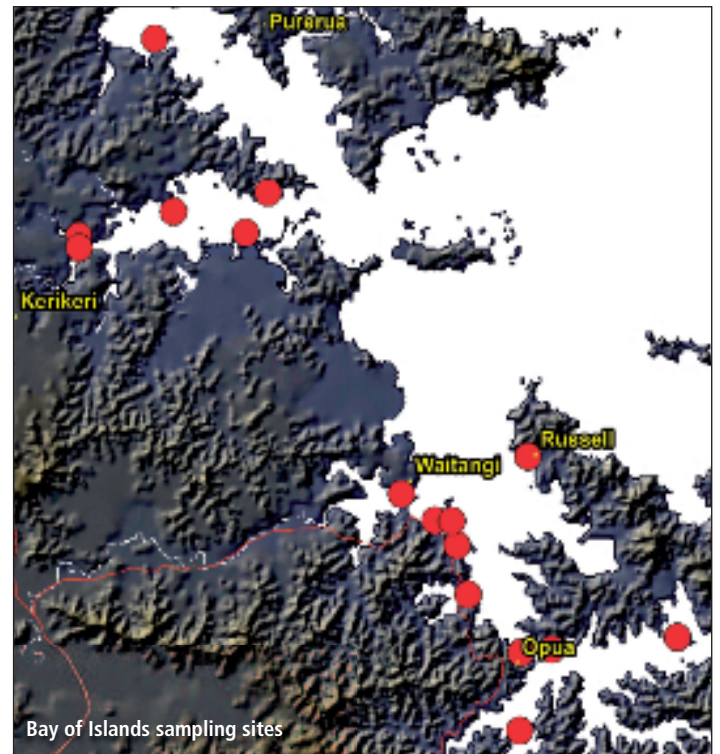
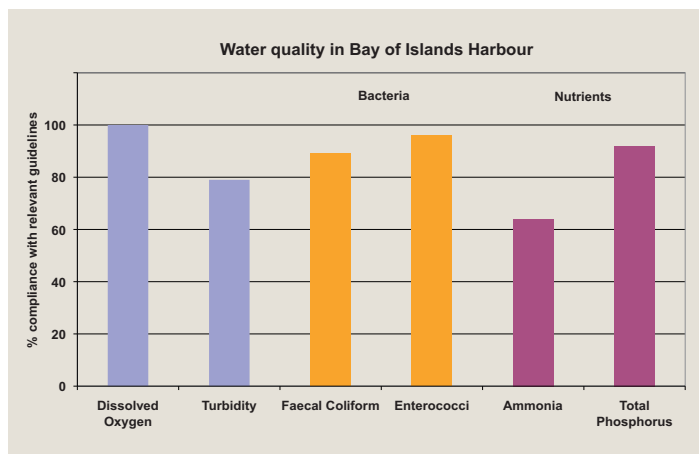
Parameter	Units	Guideline value/range
Dissolved Oxygen (DO)	% Saturation	80
Turbidity	NTU	5-10
Faecal Coliform	MPN/100mL	<150
<i>E. coli</i>	MPN/100mL	260
Enterococci	n/100mL	140
Ammonia	mg/L	0.015
Total phosphorus (TP)	g/m ³	0.03
Total nitrogen (TN)	g/m ³	0.3

MPN = most probable number. NTU = Nephelometric Turbidity Units.

Bay of Islands Harbour

In general, low concentrations of *Enterococci* and faecal coliforms were recorded in the Bay of Islands, but nutrient levels tended to be high and were often above water quality guideline values. Dissolved oxygen levels were 100% compliant with guidelines. Turbidity was 79% compliant with guidelines.

Bacteria – levels of *Enterococci* were low throughout the harbour and 96% compliance with MfE guidelines was achieved. Concentrations of faecal coliforms were 89% compliant with MfE guidelines. Non-compliance results coincided with a significant rainfall event prior to the July 2009 sampling.



Nutrients – concentrations of total phosphorus were 92% compliant with guideline values. Sites that exceeded guideline values were; Kerikeri River entrance, Kerikeri Inlet (south side of Waiunui Island), Ōpua Basin, Russell foreshore, Waikere Inlet (west side of Marriot Island) and the upper Kawakawa River. Non-compliance at these sites coincided with a significant rainfall event in July 2009. Non-compliance at a number of sites on other sampling dates appears to be site specific and did not relate to rainfall events. The level of compliance for ammonia concentrations within the Bay of Islands was 64% and ammonia levels were high at sites in the Waitangi River, Kerikeri Inlet and the upper reaches of the Kawakawa River. The majority of non-compliance occurred in July and September 2009 following heavy rainfall. The high nutrient levels found within the Bay of Islands requires further investigation.

In comparison, during 2008-2009 the levels of compliance for the Bay of Islands was 99% for *Enterococci*, 78% for total phosphorus and 63% for ammonia.

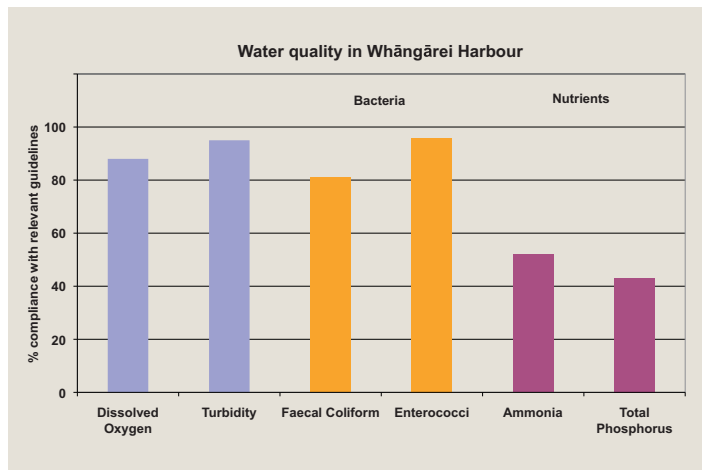
Whāngārei Harbour

In general, higher levels of nutrients and faecal coliforms were recorded at sites in the upper Whāngārei Harbour (between Onerahi and the Town Basin) and a decrease in concentrations at sites towards the harbour entrance. Dissolved oxygen was 88% compliant with guidelines, and turbidity was 95% compliant with guidelines.

Bacteria – levels of *Enterococci* were low throughout the harbour and 96% compliance with MfE guidelines was achieved. Concentrations of faecal coliforms were 81% compliant with MfE guideline values. Non-compliance occurred predominantly at sites in the Town Basin, the Waiarohia Canal and the Hātea River. The Town Basin site did not meet guideline values for faecal coliforms at any time during sampling. Investigations are underway to identify sources of faecal matter at these sites.

Coastal Water Quality

Nutrients – concentrations of total phosphorus were 43% compliant with guideline values. The sites with the highest number of non-compliance were located in the Mangapai River, Kaiwaka Point, Kissing Point, Limeburners Creek, the Town Basin, the Hātea River and Waiarohia Canal. These sites (with the exception of Kaiwaka Point) did not comply with the guidelines at any time during 2009-2010 sampling. Ammonia concentrations were high and the overall level of compliance for Whāngārei Harbour with guideline values was 52%. Ammonia concentrations were high at Kaiwaka Point, Kissing Point, Limeburners Creek, Mid Town-Basin, Port Whāngārei, Waiarohia Canal and the Hātea River and the majority of these sites did not comply with guideline values at any time during 2009-2010 sampling. In July 2009 most sites in the Whāngārei Harbour did not comply with the ammonia guideline values, which coincided with a significant rainfall prior to sampling. The high levels of nutrients found within Whāngārei Harbour require further investigation.



In comparison during 2008-2009 the levels of compliance in Whāngārei Harbour was 99% for *Enterococci*, 39% for total phosphorus and 41% for ammonia.

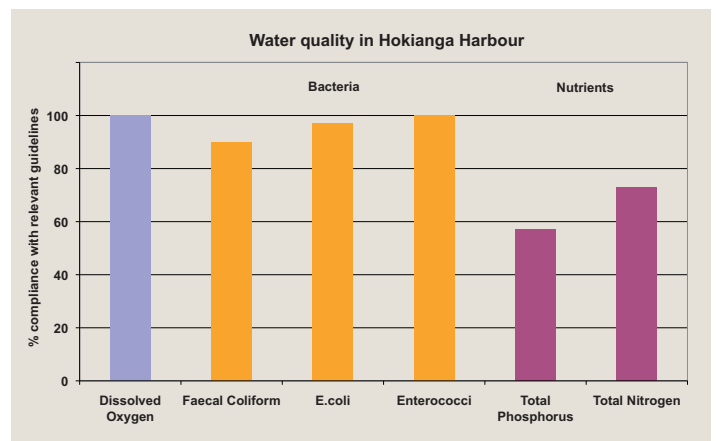


Hokianga Harbour

In general, there were low levels of faecal bacteria in the harbour, but nutrient levels were high and were often above water quality guideline values. Dissolved oxygen was 100% compliant with guidelines.



Nutrients – overall, compliance with the total phosphorus guideline level was 57% and concentrations of total phosphorus were highest at all sites in June 2009. High concentrations were also recorded at sites near river mouths, during months with high rainfall, e.g. Oraoa and Mangamuka River, Waihou River, Waima River, South Kohukohu, Rāwene, Orira River, south of Ruapapaka Island and Whirinaki River. Total nitrogen concentrations were 73% compliant with water quality guidelines. Sites where concentrations exceeded guideline levels were in the upper reaches at Waihou River, the mouth of the Oraoa and Mangamuka Rivers, Rāwene, Orira River, the mouth of the Waima River, Mangamuka River and south of Ruapapaka Island. Non-compliance tended to occur during the winter months.

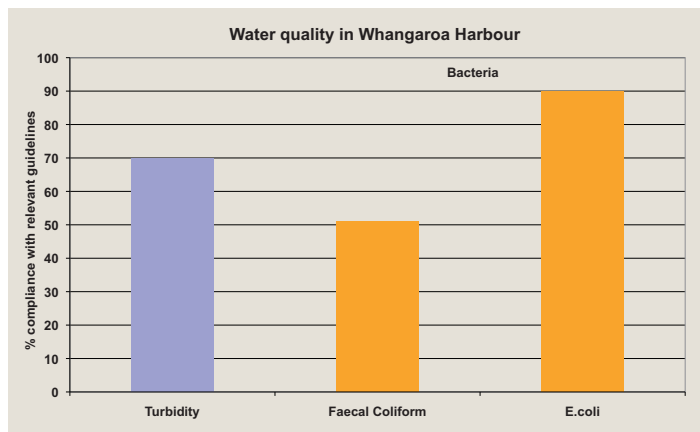


Bacteria – levels of *Enterococci* were low throughout the harbour and 100% compliance with MfE guidelines was achieved. Levels of *E. coli* were also low and 97% compliance with guideline levels was recorded. Faecal coliform levels were also low and 90% compliance was achieved. However, concentrations of *E. coli* in shellfish were only 66% compliant with New Zealand guidelines for shellfish. Non-compliance generally coincided with heavy rainfall events in June and October 2009.

Whangaroa Harbour

Bacteria – *E. coli* levels were 90% compliant with MfE guidelines at all sites and non-compliance appeared to be due to high volumes of land runoff during a large storm event in October 2009. However, concentrations of faecal coliforms were only 51% compliant with MfE guidelines, with most non-compliance recorded during winter months and after heavy rain, e.g. October 2009.

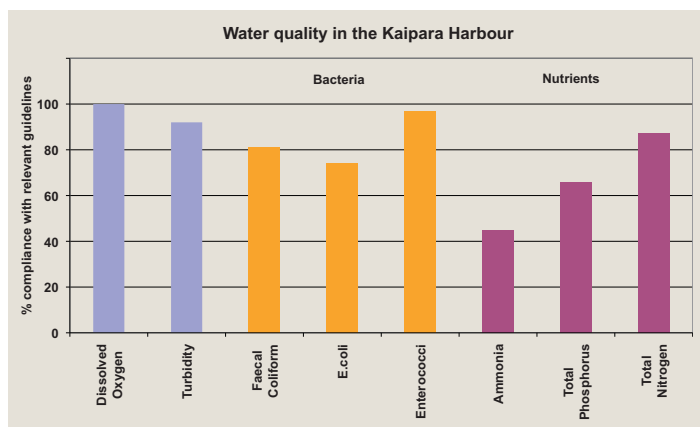
Sediments – turbidity levels were 70% compliant with guideline values. The highest turbidity levels were measured at the site west of Cape Horn and at the mouth of Waitaruke drain. The largest increase in turbidity was associated with the October storm. Further investigation of run-off and rivers are a priority for 2010-2011.



Kaipara Harbour

In general, higher concentrations of nutrients and faecal bacteria were recorded in the upper reaches of the harbour with a decrease in concentrations towards the harbour entrance.

Nutrients – concentrations were generally highest in the northern inflows, specifically nitrate-N and total phosphorus, at Wahiwaka Creek and Oruawharo River, but organic nitrogen concentrations were highest in the southern inflows. The level of compliance with the ammonia guideline was 45% and ammonia concentrations were high at nearly all sites during the winter. Three sites regularly failed to meet the total nitrogen guideline; Wairoa River (at Burgess Island), Wahiwaka Creek and Five Fathom Channel. Overall there was 87% compliance with the nitrogen guideline. Two thirds of all sites met the total phosphorus water quality guideline.



Bacteria – only one site exceeded the MfE guideline for *Enterococci*, at Wahiwaka Creek. *E. coli* levels were elevated during May 2009 and were highest in the Wahiwaka Creek, Hargreaves Basin, Arapaoa River and the outer Oruawharo River. Overall there was 81% compliance with faecal coliform guidelines, 74% compliance with *E. coli* guidelines and 97% compliance with *Enterococci* guidelines.

Sediments – the highest concentrations of suspended solids were measured during short rainy periods throughout the harbour. Turbidity levels were also measured and 92% compliance was achieved against turbidity guidelines. The highest levels of suspended solids and turbidity were measured after one large storm in November 2009. There is not a direct relationship between turbidity levels and suspended solids in waters and that is why some sites exceed the guideline levels and others do not. Hence, turbidity levels can be high but sediments in the water may be only partly contributing to the overall load.

Future

The Regional Council will continue to monitor water quality in our harbours to assess the health of these systems and to identify environmental issues. Where environmental issues are identified the Regional Council will undertake further investigations to determine the sources of contamination.

For example, the Council has begun using more sophisticated methods to track faecal contamination to determine whether the source is from wildfowl, herbivore, human or other warm blooded animals. This information will assist the Council to identify processes and pathways of contaminants entering our coastal waters and direct management initiatives to mitigate these sources and improve water quality.