



# Recreational Swimming Water Quality in Northland

Summer 2020-21



## Executive Summary

- From December 2020 to March 2021 a total of 17 Freshwater and 42 Coastal sites were monitored through the Northland Regional Council's Recreational Swimming Water Quality Programme.
- In comparison to the microbiological water quality guidelines (MfE and MoH 2003), 34 coastal sites met the guideline values and were considered suitable for swimming 100 percent of the time, 7 sites were considered suitable for swimming on all but one sampling occasion and one site on all but two occasions.
- In 2020-21, three freshwater sites met the suitable for swimming criteria 100 percent of the time, six sites were suitable for swimming on all but one occasion, three sites were suitable for swimming on all but two occasions and four sites were unsuitable for swimming on more than three occasions.
- Results from sites recording elevated bacteria levels were cross referenced with rainfall data to indicate whether rainfall related runoff from land was likely to have contributed to elevated results. Overall, 29 'Action' level results were recorded for 14 of the 17 freshwater sites, of which 35 percent were likely to have been related to rainfall. At the coastal sites, nine 'Action' level results were recorded for 8 of the 42 coastal sites, of which 22 percent were likely to have been related to rainfall.
- The Ministry for the Environment for recreational shellfish gathering showed that 8 of the 15 monitoring sites were within guidelines during summer 2020-21.
- Microbial source tracking was available for all samples and was undertaken on all but one 'Action' level result. In total, 29 freshwater samples and 7 coastal samples were analysed for source tracking. Results generally indicated ruminant and avian sources, though human contamination was identified at two sites.

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## Background

Water can occasionally be contaminated by faecal contamination which can contain disease-causing microorganisms. Swimming in contaminated water can lead illnesses such as skin, eye and ear infections, gastrointestinal and respiratory illnesses (Jarman 2002a).

The Recreational Swimming Water Quality Programme (RSWQP) is a joint project administered by the Northland Regional Council (the Council), in partnership with the Northland District Health Board (NDHB), the Far North District Council (FNDC), the Whangārei District Council (WDC) and the Kaipara District Council (KDC). The programme design is derived from the Ministry for the Environment (MfE) and Ministry of Health (MoH) Microbiological Water Quality Guidelines (2003). The aim of the programme is to provide information on microbiological contamination at popular freshwater and coastal swimming sites in Northland, to allow the public to make informed decisions about where to swim.

Previous sampling has shown some sites, in particular freshwater sites or those with a freshwater influence such as harbours and estuaries, to be unsuitable for swimming, especially after heavy rainfall.

Previous microbial source tracking has identified wildfowl (ducks and gulls) and ruminant (including cattle and sheep) as the most common sources of contamination. Human sources of contamination have also previously been identified.

## National Guidelines

It is both difficult and expensive to measure the levels of pathogens in water. Instead, the National *Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas* were developed by the Ministry for the Environment and the Ministry of Health in June 2003 to provide a more practical means of determining risk to human health when bathing in our waterways and coastal environment. These guidelines provide for safe levels of faecal indicator bacteria for contact recreation based on the relationship between bacteria and pathogens based on previous epidemiological studies. In freshwater environments, E.Coli is used. Enterococci (Ent.) bacteria levels are measured at open coastal sites. Where a coastal site is influenced by river input, or is considered to be semi-enclosed, e.g. harbours and estuaries, a combination of Enterococci bacteria and faecal coliforms are used.

<http://www.mfe.govt.nz/publications/fresh-water/microbiological-water-quality-guidelines-marine-and-freshwater-0>.

# Applying the Guidelines

Where practicable, the RSWQP follows the recommendations in the guidelines, and results from the programme are assessed against the guidelines based on single (weekly) and overall compliance for the sampling season.

The guidelines provide a grade and recommended course of action for each sample collected, with recommended responses based on increasing risk. Current responses to elevated levels differ to the guidelines slightly due to microbial source tracking now being available, making it quicker and easier to identify sources of faecal contamination and determine appropriate actions of response.

**Table 1: Single sample categories**

Category	<i>Freshwater sites (E. coli)</i>	<i>Open Coastal Sites (Enterococci)</i>	<b>Enclosed Coastal Sites (Enterococci and Faecal Coliforms)</b>	<b>Response</b>
Suitable	E.coli ≤260/100mL	Ent. ≤140/100mL	FC ≤150/100mL and Ent. ≤140/100mL	No response necessary – continue weekly sampling
Alert	E.coli 260 - 540/100mL	Ent. 140 - 280/100mL	FC 150- 600/100mL Or Ent. 140 - 280/100mL	Collect follow-up sample. Consider microbial source tracking to isolate source of faecal contamination.
Action	E.coli >540/100mL	Ent. >280/100mL	FC >600/100 mL Or Ent. >280/100mL	Collect follow-up sample. Undertake microbial source tracking to isolate source of faecal contamination. Undertake sanitary survey when applicable. Erect warning signs.

The results for each site are also graded according to the percentage of samples which fell within the “suitable” for swimming category for E. coli and enterococci concentrations (MfE/MoH, 2003) as shown in Table 4 below:

**Table 2: End of season grading system**

1	95-100% samples within guidelines
2	90-95% samples within guidelines
3	75-90% samples within guidelines
4	<75% samples within guidelines



## Programme Procedure



**Photo 1: Council staff taking a water sample at Lake Waro, Hikurangi**

Samples are collected weekly at selected freshwater and coastal sites throughout the summer months.

While some other councils choose not to sample after rainfall, water samples are collected regardless of weather conditions although weather, tide and water temperature are recorded to provide some context for interpretation of the results.

Sampling is undertaken on Mondays, except on public holidays where sampling is undertaken on the next workday. Results from the weekly sampling are sent to the District Councils and NDHB and are published weekly on the LAWA website - <https://www.lawa.org.nz/explore-data/swimming/> - as soon as received, generally Wednesday mornings.

Samples are analysed for faecal indicator bacteria (FIB) with results assessed against the Ministry for the Environment's *Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas*. Where FIB results exceed the safe recreational bathing limits, microbial source tracking is generally undertaken. All samples are analysed by an independent laboratory using standard analytical procedures.

The results are distributed to key stakeholders (including District Councils) and the public as soon as received from the laboratory. Where results exceed the guidelines, the local district councils undertake follow-up sampling. Where results from the follow-up sampling remain at 'Action' level, the District Council erects warning signs which remain in place until further testing returns bacteria levels below 'Action' level.

Where issues are identified, the Regional and District Councils work to identify the source of contamination and work towards improving water quality.

## Site Selection

Due to the large number of swimming sites in Northland, it is not practicable or economical to monitor them all and therefore the most popular sites are prioritised for monitoring.

Each year, the sites to be monitored is reviewed in consultation with key stakeholders at a pre-season meeting. Sites are selected based on usage and popularity and historical bacteria levels; consistently elevated or not.

Generally, sampling sites remain the same year to year, however a thorough review of the sampling sites was undertaken by the Northland Regional Council, including previous public consultation and consultation with the district councils and Northland District Health Board.

15 sites were discontinued and 14 new sites added for the 2020-21 sampling season. A total of 42 coastal and 17 freshwater sites were monitored as part of the RSWQP.



Figure 1: Sites for 2020/21

The full list of sites for 2020-21 are listed in Appendix 1.



Samples are collected weekly at selected freshwater and coastal sites throughout the summer months. In 2020-21, sampling was carried out from 7 December 2020 to 8 March 2021 at 42 coastal and 16 freshwater sites. While some other councils choose not to sample after rainfall, the Council collects water samples regardless of weather conditions although weather, tide and water temperature are recorded to provide some context for interpretation of the results. Samples are collected weekly at selected freshwater and coastal sites throughout the summer months. In 2020-21, sampling was carried out from 7 December 2020 to 8 March 2021 at 42 coastal and 16 freshwater sites. While some other councils choose not to sample after rainfall, Council collects water samples regardless of weather conditions although weather, tide and water temperature are recorded to provide some context for interpretation of the results. Samples are collected weekly at selected freshwater and coastal sites throughout the summer months. In 2020-21, sampling was carried out from 7 December 2020 to 8 March 2021 at 42 coastal and 16 freshwater sites.

## Results and Interpretation

The swimming water quality results for all sites monitored in 2020-21 can be found at <https://www.lawa.org.nz/explore-data/swimming/>.

Northland monthly rainfall maps covering the 2020-21 summer period are presented in Appendix 3.

The investigation programme including sites listed for further analysis to identify the source of contamination is detailed in Section 2.

## End of season grading – Coastal sites

Figure 2 displays the end of season grades for samples taken from each of the 46 coastal sites monitored in Northland during the 2020-21 sampling season (December 2020 to March 2021). The grades indicate the percentage of samples which fell within the “suitable” for swimming category at each site over the summer period.

While there are occasional exceedances of the swimming water quality guidelines (particularly at sites with significant freshwater inputs e.g., estuaries), generally coastal water quality in Northland is excellent with the majority of sites suitable for swimming on most sampling occasions.

Each ‘Action’ result has been cross-referenced with accumulated rainfall data collected 72 hours prior to sampling, indicating whether rainfall related runoff from land was contributing to elevated results (refer to tables below). Overall, nine ‘Action’ level results were recorded for 8 of the 42 coastal sites, of which 22 percent were likely to have been related to rainfall.



Figure 2: Coastal end of season compliance grading 2020-21

Table 3: Number of Alert/Action level results with accumulated rainfall for coastal sites

## FAR NORTH

Site name	No. samples	Suitable/Alert	Action	Rainfall related (mm, 72h accumulated rainfall)
Ahipara	15	14	1	76.5mm
Houhora heads	14	13	1	0mm
Tokerau Beach	14	14	0	N/A
Whatuwhiwhi	14	14	0	N/A
Rangiputa	15	13	2	0.5mm, 1mm
<b>Total</b>	<b>72</b>	<b>68</b>	<b>4</b>	

## NORTH EAST

Site name	No. samples	Suitable/Alert	Action	Rainfall related (mm, 72h accumulated rainfall)
Coopers Beach	14	14	0	N/A
Matauri Bay	12	12	0	N/A
Taipā Estuary	15	15	0	N/A
Little Cable Bay	14	14	0	N/A
Taupo Bay	14	14	0	N/A
<b>Total</b>	<b>69</b>	<b>69</b>	<b>0</b>	

## NORTH WEST

Site name	No. samples	Suitable/Alert	Action	Rainfall related (mm, 72h accumulated rainfall)
Ōmāpere	14	14	0	N/A
Opononi	14	14	0	N/A
Rawene*	14	13	1	0.5mm
<b>Total</b>	<b>42</b>	<b>41</b>	<b>1</b>	

## SOUTH WEST

Site name	No. samples	Suitable/Alert	Action	Rainfall related (mm, 72h accumulated rainfall)
Pahi jetty*	13	13	0	n/a
<b>Total</b>	<b>13</b>	<b>13</b>	<b>0</b>	

## BAY OF ISLANDS

Site name	No. samples	Suitable/Alert	Action	Rainfall related (mm, 72h accumulated rainfall)
Oakura	14	14	0	N/A
Ohawini Bay	15	14	1	1.5mm
Paihia Te Haumi	13	13	0	N/A
Paihia Waitangi Bridge	13	12	1	75.5mm
Paihia Seaview Road	14	13	1	0mm
Teal Bay	14	14	0	N/A
<b>Total</b>	<b>83</b>	<b>80</b>	<b>3</b>	

## SOUTH EAST

Site name	No. samples	Suitable/Alert	Action	Rainfall related (mm, 72h accumulated rainfall)
One Tree Point	13	13	0	N/A
Langs Beach midway	12	12	0	N/A

Mangawhai Heads motor camp*	13	13	0	N/A
Mangawhai Heads	12	12	0	N/A
Ruakākā Beach	13	13	0	N/A
Ruakākā River	11	11	0	N/A
Waipū Cove Beach	12	12	0	N/A
<b>Total</b>	<b>86</b>	<b>86</b>	<b>0</b>	

## TUTUKAKA

Site name	No. samples	Suitable/Alert	Action	Rainfall related (mm, 72h accumulated rainfall)
Church Bay	14	14	0	N/A
Matapōuri Northern Bridge*	15	15	0	N/A
Matapōuri Southern Bridge*	16	16	0	N/A
Ngunguru at School	14	14	0	N/A
Otamure Bay	14	14	0	N/A
Pacific Bay	15	15	0	N/A
Sandy Bay	14	14	0	N/A
Wellingtons Bay	14	14	0	N/A
Whananaki at east beach	15	15	0	N/A
<b>Total</b>	<b>131</b>	<b>131</b>	<b>0</b>	

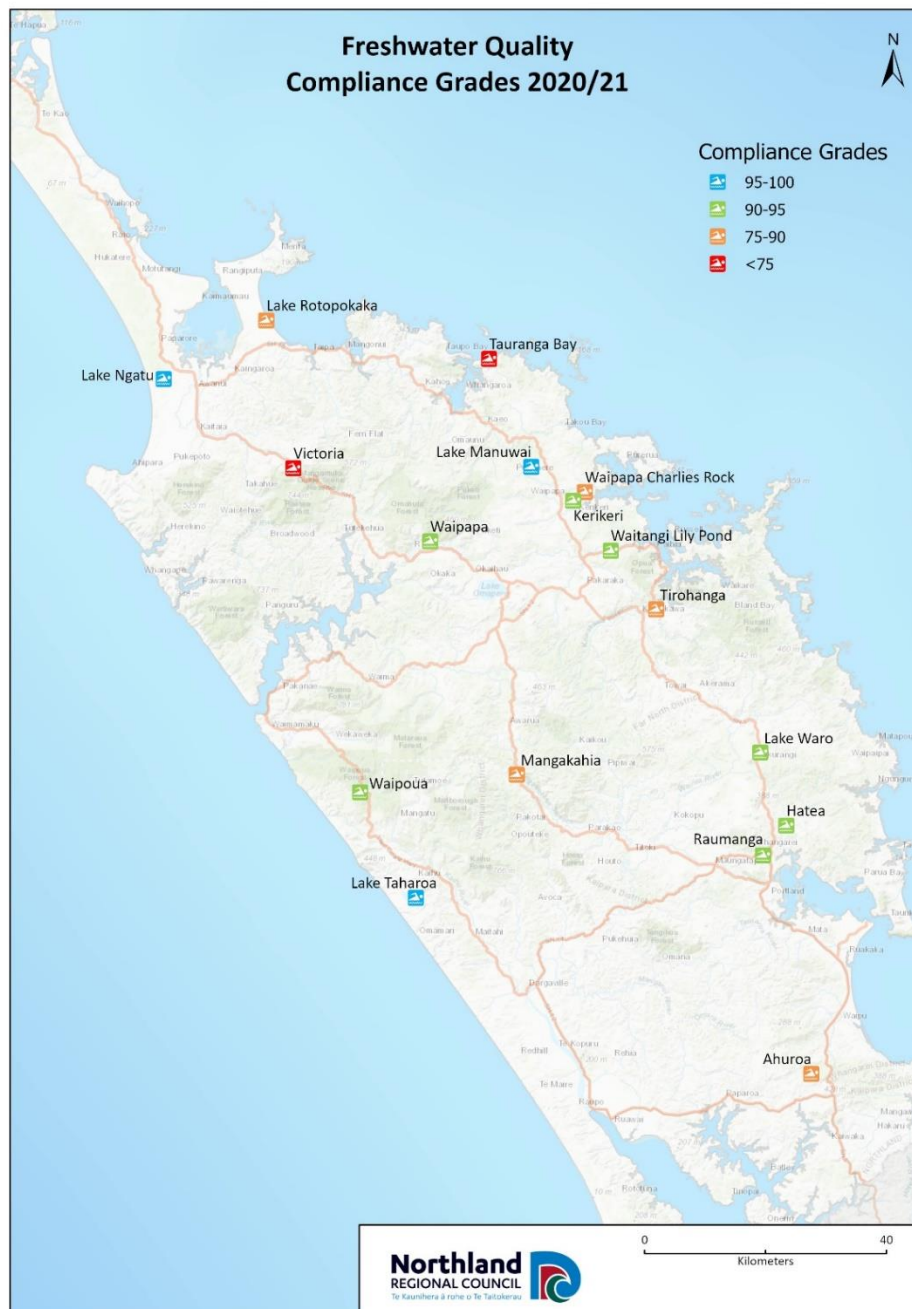
## WHANGĀREIHEADS

Site name	No. samples	Suitable/Alert	Action	Rainfall related (mm, 72h accumulated rainfall)
McLeods Bay	14	14	0	N/A
Ocean Beach	10	10	0	N/A
Onerahi	14	14	0	N/A
Taurikura	15	14	1	3mm
Pataua South	14	14	0	N/A
Tamaterau Bay	14	14	0	N/A
<b>Total</b>	<b>81</b>	<b>80</b>	<b>1</b>	

## End of season grading – Freshwater sites

Compared to the coast, river sites are more susceptible to rainfall related runoff from surrounding land. In summer, Northland is often subject to intense sub-tropical storm events which, combined with soils dominated by clay – which have poor infiltration rates and therefore less capacity to absorb water – the result is rapid runoff. During dry periods contaminants build up on the land and when a storm hits, the result is a 'first flush' of contaminant laden water. For this reason, poorer grades are usually recorded at river sites compared to those located at the coast or in freshwater lakes.

Figure3 displays the end of season grades for samples taken from each of the 17 freshwater sites monitored in Northland during the 2020-21 sampling season (December 2020 to 2 March 2021). The grades indicate the percentage of samples which fell within the “suitable” for swimming category at each site over the summer period.



**Figure 3: Freshwater end of season grading 2020-21**

Over 50 percent of sites in 2020-21 had more than 90 percent of samples fall within suitable faecal indicator bacteria levels. This is higher in comparison to the previous season. Around 12 percent of sites fell in the lowest category (less than 75 percent) which again is an improvement on the previous season.

Each ‘Action’ result has been cross-referenced with accumulated rainfall data collected 72 hours prior to sampling, indicating whether rainfall related runoff from land was



contributing to elevated results (refer to tables below). Overall, 20 'Action' level results were recorded for seven of the 14 freshwater sites, of which 35 percent were likely to have been related to rainfall.

**Table 4: Number of Alert/Action level results with accumulated rainfall for freshwater sites**

## FAR NORTH AREA

Site name	No. samples	Suitable/Alert	Action	Rainfall related (mm, 72h accumulated rainfall)
Kerikeri Rainbow Falls	13	12	1	118.5mm
Lake Manuwai	13	13	0	N/A
Lake Ngatu	14	14	0	N/A
Lake Rotopokaka (Coca-Cola)	15	13	2	49mm, 0mm
Tirohanga Stream	14	11	3	0mm, 0mm, 114.5mm
Victoria River	21	15	6	0mm, 0mm, 0mm, 1.5mm, 0mm, 6.5mm
Tauranga Stream	15	11	4	0mm, 3.2mm, 1mm, 0.5mm
Waipapa River	10	9	1	118.5mm
Waitangi at Lily Pond	14	13	1	118.5mm
Waipoua River	14	13	1	157.5mm
Waipapa at Charlies Rock	15	13	2	0mm, 118.5mm
<b>Total</b>	<b>158</b>	<b>137</b>	<b>21</b>	

### *Waipoua River*

One 'Action' level result was likely to have been related to rainfall. This site has been monitored since 2005-06 and accounted for 16 'Action' results on 199 sampling occasions within the same time frame. This means the site was considered suitable for swimming 92 percent of the time during the summer season in the last 15 years.

Microbial source tracking analyses has identified faecal contamination caused by ruminant, human and birds.

### *Tauranga Stream*

This new site had four 'action' level results which neither of the sample results correlated with rainfall. Microbial source tracing analyses has identified faecal contamination caused by birds, ruminant and humans.

## WHANGĀREI AREA

Site name	No. samples	Surveillance/Alert	Action	Rainfall related (72h accumulated rainfall)
Lake Waro	15	14	1	1mm
Raumanga Stream	16	15	1	67.6mm
Hātea at Whareroa Rd	14	13	1	67.6mm
Mangakāhia Swimming hole	15	13	2	71.5mm, 0mm
<b>Total</b>	<b>60</b>	<b>55</b>	<b>5</b>	

### *Mangakāhia Swimming hole*

This is a new site added this year, one of the 'action' result is likely to have been related to rainfall.

Microbial source tracking analyses has identified faecal contamination caused by ruminant, human and birds.

## KAIPARA AREA

Site name	No. samples	Surveillance/Alert	Action	Rainfall related (72h accumulated rainfall)
Ahuroa River at Piroa Falls	16	13	3	0.5mm, 0mm, 2.5mm
Lake Taharoa	14	14	0	N/A
<b>Total</b>	<b>30</b>	<b>27</b>	<b>3</b>	

### *Ahuroa River at Piroa Falls*

The 'Action' result was likely to have been related to rainfall. This site has been monitored since 2017-18 and accounted for 25 'Action' results out of 58 sampling occasions within the same time frame. This means the site was considered suitable for swimming 56 percent of the time during the summer season in the last four years.

Microbial source tracking analyses has identified faecal contamination caused by ruminant, human and birds.

# Investigation

## Microbial Source Tracking

### Methodology

Unlike previous years, all samples collected were able to be analysed for microbial source tracking using PCR analysis and were undertaken on request, based on results of the faecal indicator bacteria of each sample. PCR analysis was undertaken for two human markers (HF183, HumM2), ruminant, and avian.

All action level results, except one, were analysed for source tracking; 22 freshwater samples and 8 coastal. Nine alert level results were analysed for source tracking based on judgement of previous results at the relevant site, eg. if all results at a site had been within source guidelines, source tracking was undertaken.

### Results

Across all action and alert level samples that were analysed for source tracking there were 22 different coastal and freshwater sites. Ruminant sources were detected in 19 of the samples, avian sources in 17 of the samples, human sources detected in 6 samples and 4 results were inconclusive.

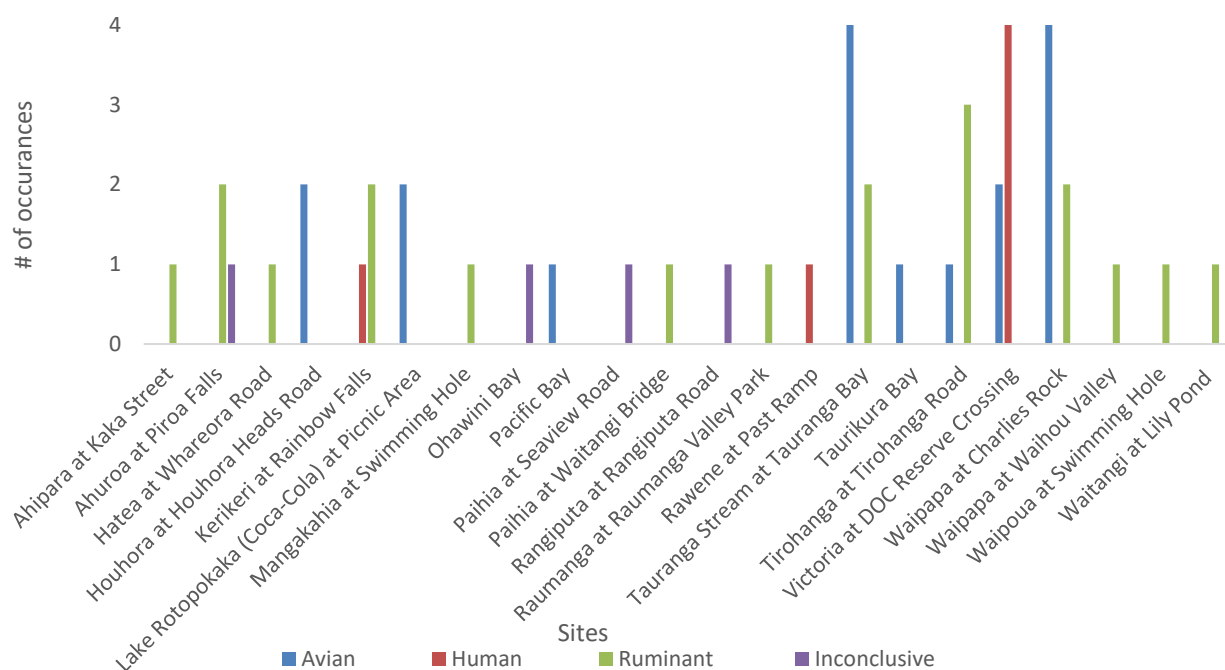


Figure 4: Number of sources detected at each site that was analysed for microbial source tracking.

## Site investigations

One site investigation was undertaken at Victoria Falls this season due to consistently elevated E. coli levels and microbial source tracking results. Microbial source tracking analysis throughout the season identified faecal contamination caused by birds, ruminant and humans. As a result, a site investigation was undertaken.

This site has been monitored since 2007-08 and accounted for 33 'Action' results on 185 sampling occasions over this time frame. This means the site was considered suitable for swimming 82 percent of the time during the summer season in the last 13 years.

Over time, the site has been subject to ongoing and unexplained elevated results. A study on whether the site is subject to naturalised E. coli was undertaken by NIWA. This study found that the E. coli results may be due to sustained populations of the bacteria within the stream, rather than representing recent contamination of faecal sources.

This site investigation supported this theory. The upstream catchment is undeveloped, predominantly native bush, and no sources of contamination were able to be identified.

## Water Quality for Recreational Shellfish Gathering

In addition to assessing sites for their suitability for swimming, results from popular shellfish gathering sites were compared to the MfE and MoH microbiological guidelines for shellfish gathering. The guidelines are based on those used by the shellfish industry and are globally recognised. The guidelines use faecal coliforms in the water as an indicator of the potential presence of pathogens and viruses in shellfish; they do not intend to measure bacteria levels in the shellfish directly.

Although Council uses these guidelines to grade sites for recreational shellfish gathering, the method used to count the number of faecal coliforms present in a water sample differs from the one recommended in the guidelines. The Council uses colony forming units (CFU) which is a direct measure of bacteria grown on an agar plate used in microbiology. This means that results may differ slightly when compared to the most probable number (MPN) method. Despite this, the two methods give results that are close enough for comparing to the guidelines.

## Guideline values

There are two guideline values for assessing water quality for shellfish gathering:

The median faecal coliform content of samples taken over the entire shellfish gathering season shall not exceed a most probable number (MPN) of 14/100mL;

And

No more than 10 percent of samples should exceed an MPN of 43/100mL.

## Results 2020/21

The results for 15 permanent shellfish monitoring sites sampled during 2020/21 are presented in 5.

**Table 5: Results for recreational shellfish gathering permanent monitoring sites 2020/21**

Site no.	Shellfish Monitoring Sites	1	2	3	4	5	6	7	8	9	10	11	12	13	14					
Site ID	Site Name	7-Dec-20	14-Dec20	21-Dec20	29-Dec20	5-Jan-21	11-Jan-21	18-Jan-21	26-Jan-21	2-Feb-21	9 Feb 21	16-Feb-21	22-Feb-21	1-Mar-21	8-Mar-21	Samples	Exceedances	Exceedance %	Median	Pass/Fail
108314	Ruakākā River at Below Motor Camp	13	30	40		5	25	15		12	56	22	28	32	12	12	1	8.3	23.5	Fail
102425	Matauri Bay at Campground		3.3	1.7	260		1.7	1.7	1.7	1.7	1.7	8.3	1.7	1.7	1.7	12	1	8.3	1.7	Pass
101195	Paihia at Te Haumi		1.7	1.7	3.3		1.7	1.7	5	1.7	5	22	27	15	1.7	12	0	0.0	2.5	Pass
105777	Taipā Estuary at Boat Ramp	1.7	1.7	1.7	1.7	1.7	3.3	3.3	3.3	1.7	12	8.3	20	1.7	68	14	1	7.1	2.5	Pass
109266	One Tree Point at Intertidal Beach	5		10	1.7	6.7	1.7	20	1.7	1.7	1.7	18	1.7	46	1.7	13	0	0.0	1.7	Pass
101210	Mangawhai Heads at Motor Camp	13		1.7	5	1.7	1.7	1.7	1.7	18	8.3	170	96	32	13	13	2	15.38	8.3	Fail
108320	Ngunguru Estuary at School	22	1.7	12	1.7	110	12	48	1.7	25	3.3	22	1.7	28	1.7	14	2	14.29	12	Fail
109879	Sandy Bay at Mid Beach	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	22	1.7	14	0	0.0	1.7	Pass
101345	Ōākura Bay at North End	1.7	15	20	1.7	1.7	1.7	1.7	3.3	1.7	10	250	1.7	12	1.7	14	1	7.1	1.7	Pass
109877	Ocean Beach at Mid Beach	13	1.7	1.7	22	1.7	1.7	1.7	1.7	1.7	3.3					10	0	0.0	1.7	Pass
105388	Ohawini Bay	1.7	1.7	20	1.7	1.7	8.3	8.3	12	13	54	66	1.7	23	3.3	14	2	14.3	8.3	Fail
101331	Teal Bay	1.7	1.7	5	1.7	1.7	6.7	1.7	1.7	6.7	33	200	40	3.3	1.7	14	1	7.1	2.5	Pass
327646	Houhora at Houhora Heads Road	23	6.7	120	1.7	12	1.7	10	5	1.7	30	3.3	220	25	270	14	3	21.43	11	Fail
108315	Ruakākā Beach at Surf Club	1.7		1.7	1.7	1.7	6.7	1.7	1.7	1.7	17	13	15	5	1.7	13	0	0	1.7	Pass
101262	Taurikura Bay	27	76	1.7	10	1.7	1.7	1.7	1.7	1.7	1.7	27	1.7	120	1.7	14	1	7.14	1.7	Pass



Results indicated that 10 out of 15 of the sites monitored were within the MfE and MoH guidelines for shellfish gathering in 2020-21. However, it is important to note that samples were only collected over the summer months rather than for the entire shellfish gathering season, which excluding scallops, is all year round in Northland. Therefore, these results can only be used as an indication of the suitability for shellfish gathering at a site.

## Summary and Conclusions

### Coastal sites

The results from 2020/21 indicate that 98 percent of the samples collected at coastal sites were considered suitable for recreational use throughout the season. While there are occasional exceedances of the “Action” level guidelines at sites with significant freshwater inputs (e.g. estuaries) and after heavy rainfall, generally coastal water quality in Northland is excellent with the majority of sites suitable for swimming on most sampling occasions.

In comparison to guidelines, 34 coastal sites met the guideline values and were considered suitable for swimming 100 percent of the time, 7 sites were considered suitable for swimming on all but one sampling occasion and one site on all but two occasions.

Many of the ‘Action’ results recorded for coastal sites can be attributed to frequent and heavy rainfall during the summer.

### Freshwater sites

The results from 2020/21 indicate that 88 percent of the samples collected at freshwater sites were considered suitable for recreational use throughout the season.

In comparison to guidelines, three freshwater sites met the suitable for swimming criteria 100 percent of the time, seven sites on all but one occasion and three sites on all but two sampling occasions. Four freshwater sites were considered unsuitable for swimming on three or more occasions during the summer.

## Investigation

Microbial source tracking analyses were carried out for each sample above ‘Action’ level. Results indicated human, ruminant and/or wildfowl contamination.

One site investigation was undertaken at Victoria River. No sources of contamination were identified.

### Shellfish gathering

The results for the 15 monitoring sites sampled during 2020/21 for their suitability for recreational shellfish gathering indicated that 10 sites were within the microbiological water quality guidelines.

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## Abbreviations

FIB: faecal indicator bacteria

FNDC: Far North District Council

KDC: Kaipara District Council

MfE: Ministry for the Environment

MoH: Ministry of Health

NDHB: Northland District Health Board

NIWA: National Institute of Water and Atmospheric research

PCE: Parliamentary Commissioner for the Environment

RSWQP: Recreational Swimming Water Quality Programme

TLAs: Territorial Local Authorities

WDC: Whangārei District Council

## Appendix

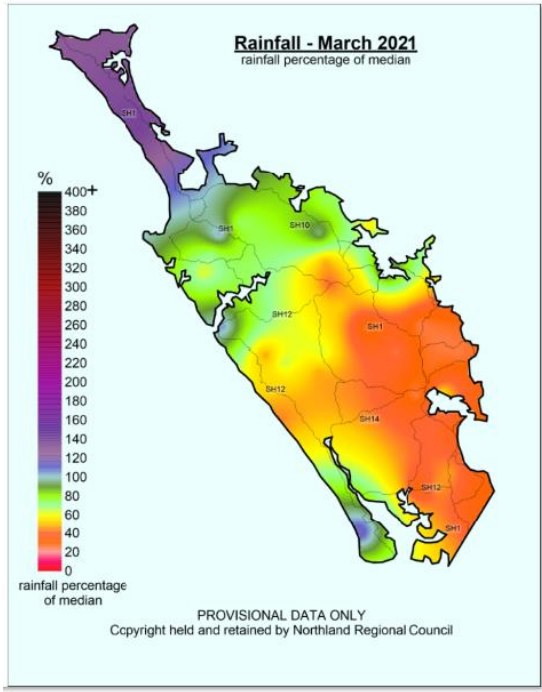
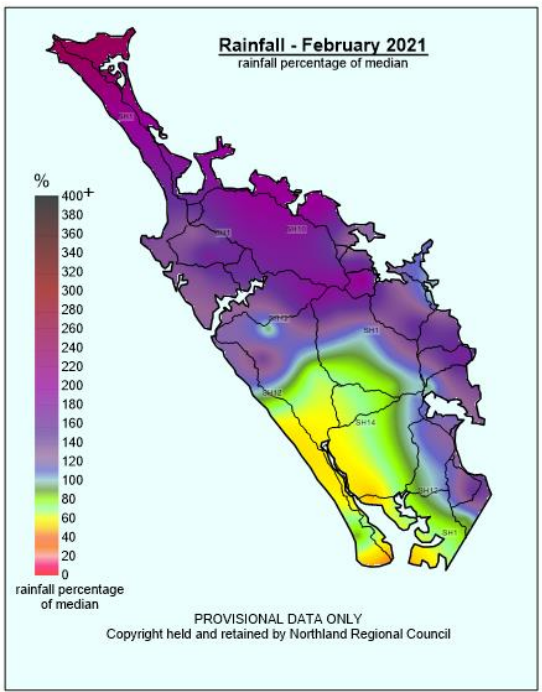
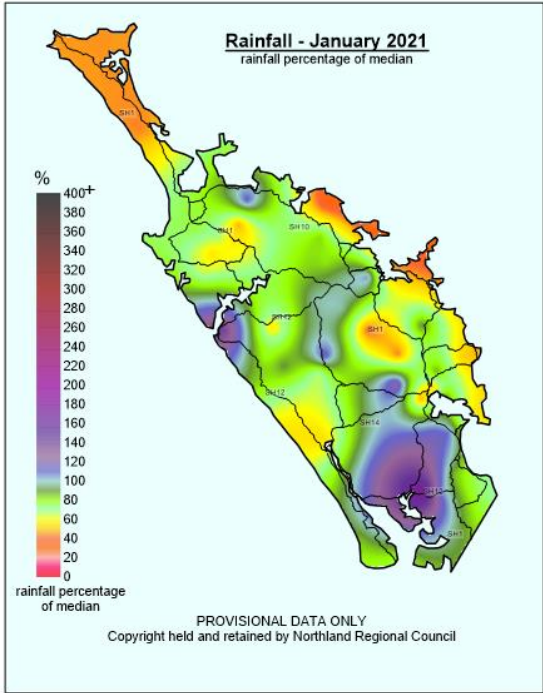
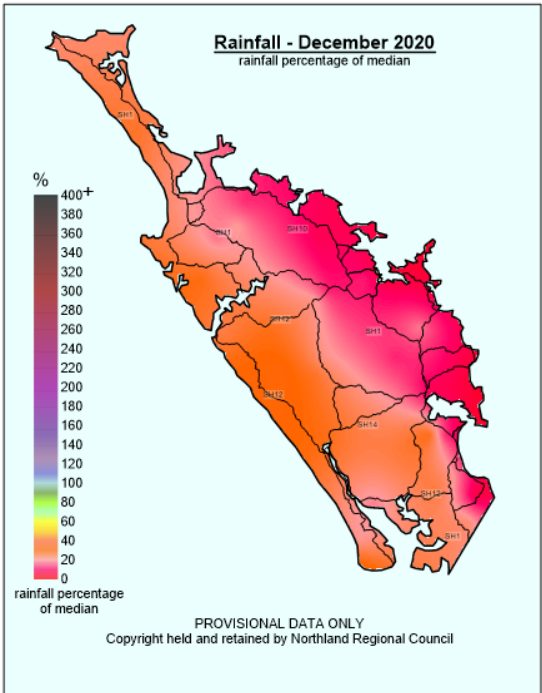
### Sampling Sites for 2020/21

Coastal sites	Grid reference		Site No.
Far North District Council			
Ahipara campground	1614114	6109386	109871
Coopers Beach Foreshore	1646729	6127976	101066
Houhora Heads	1613542	6146542	327646
Little Cable Bay	1643639	6128054	327654
Matauri Bay motor camp	1683324	6122702	102425
Ōmāpere	1634959	6067633	318360
Opononi	1635376	6070804	106011
Paihia beside toilets	1699822	6094837	101194
Paihia Te Haumi	1700137	6093454	101195
Paihia Waitangi Bridge	1698267	6096116	101183
Rawene*	1646026	6083073	100236
Rangiputa	1626603	6140292	327647
Taipā Estuary	1642856	6127391	105777
Taupo Bay	1665145	6127445	327656
Tokerau Beach	1633974	6139217	109872
Whatuwhiwhi Holiday Park	1635586	6140618	327648
Kaipara District Council			
Mangawhai Heads Beach	1743817	6006166	109890
Mangawhai Heads motor camp*	1743147	6005606	101210
Pahi - 150m NW jetty*	1710590	5998103	102198
Whangārei District Council			
Church Bay	1738528	6057429	105448
Lang's Beach	1738350	6009900	108318
Matapouri southern bridge*	1736959	6062631	100711
Matapouri northern bridge*	1736535	6063041	100712
Ngunguru Estuary at school	1737070	6056341	108320

Coastal sites	Grid reference		Site No.
Ōākura Bay	1722350	6083581	101345
Ocean Beach	1742107	6032989	109877
Ohawini Bay	1722090	6084082	105388
One Tree Point	1731539	6035180	109266
Onerahi playground*	1722792	6040203	101600
Otamure Bay	1732610	6071608	311666
Pacific Bay	1738969	6057164	108313
McLeod Bay	1735908	6035832	101254
Pataua South at East End	1738315	6046464	104986
Ruakākā Beach	1731913	6025221	108315
Ruakākā River	1731414	6025773	108314
Sandy Bay	1733651	6064285	109879
Taurikura Bay	1737880	6034149	101262
Tamaterau Bay at Whangārei Heads Road	1727891	6039477	318123
Teal Bay	1723703	6077721	101331
Waipū Cove	1735915	6011855	108316
Wellingtons/Whangaumu Bay	1738576	6055370	109880
Whananaki east beach	1733002	6069592	106938
<b>TOTAL COASTAL</b>	<b>42</b>		

Freshwater Sites	Grid Reference		Site No.
Far North District Council			
Kerikeri at Rainbow Falls	1685773	6102740	308794
Lake Ngatu	1618033	6122885	100402
Lake Manuwai	1678843	6108359	103150
Tirohanga Stream	1699502	6084784	102252
Tauranga Stream	1671865	6126219	325519
Victoria River	1639482	6108122	104908
Waipapa River at forest pools	1662099	6096027	103248
Waipapa at Charlies Rock	1687681	6104181	110348
Waipoua River at DOC HQ	1650503	6054513	108613
Waitangi at Lily Pond	1691974	6094500	104830
Lake Rotopokaka (Coca-cola)	1635006	6132588	105413
Kaipara District Council			
Ahuroa at Piroa Falls	1725149	6007913	317597
Lake Taharoa pump house	1659736	6037045	105434
Whangārei District Council			
Lake Waro (Hikurangi)	1716716	6061100	107272
Raumanga Stream	1717608	6044187	103246
Hātea at Whareora Road	1721028	6049003	327623
Mangakāhia Swimming Hole	1676448	6057451	327649
TOTAL FRESHWATER	17		

# Rainfall Maps Summer 2020/21





## When to avoid contact recreation

In order to minimise the risk when using rivers or the coast for contact recreation, the following should be considered:

### Clarity

Stagnant and/or murky water contains more pathogens than clear and/or flowing water. The amount of suspended solids in water which reduces water clarity, and agricultural run-off which can contain elevated levels of pathogens, are often related. A simple way of reducing the risk of contamination is to only swim in water in which feet can be seen when standing knee deep.

### Discolouration, foams and odour

Water can be unsuitable for swimming if it has an unpleasant smell, if it is discoloured, or if there is foam or scum on the water's surface. Even if the water is relatively clear, foams, discolouration and/or odour are often a sign of contamination.

### Rainfall



Photo 2: Kapiro Stream

Rainfall can have a significant impact on water quality, particularly in freshwater. When it rains, some rain flows off the land as runoff which carries contaminants into rivers and lakes, and eventually the sea.

In areas of limited mixing, such as lakes or slow-flowing rivers, this can result in elevated levels of contaminants for several days after heavy rainfall. Areas with greater mixing, for example, open coastal sites where the tide flushes contaminants out to sea, are less susceptible to the effects of rainfall related runoff.

Higher flows in rivers and stormy conditions along the coast can cause re-suspension of contaminants attached to riverbank or bed sediment. High intensity rainfall can also affect municipal sewage and septic tank systems, resulting in overflow of human waste into water.

As a rule, it is recommended to wait 48 hours after heavy rainfall before swimming in freshwater or semi-enclosed coastal sites.