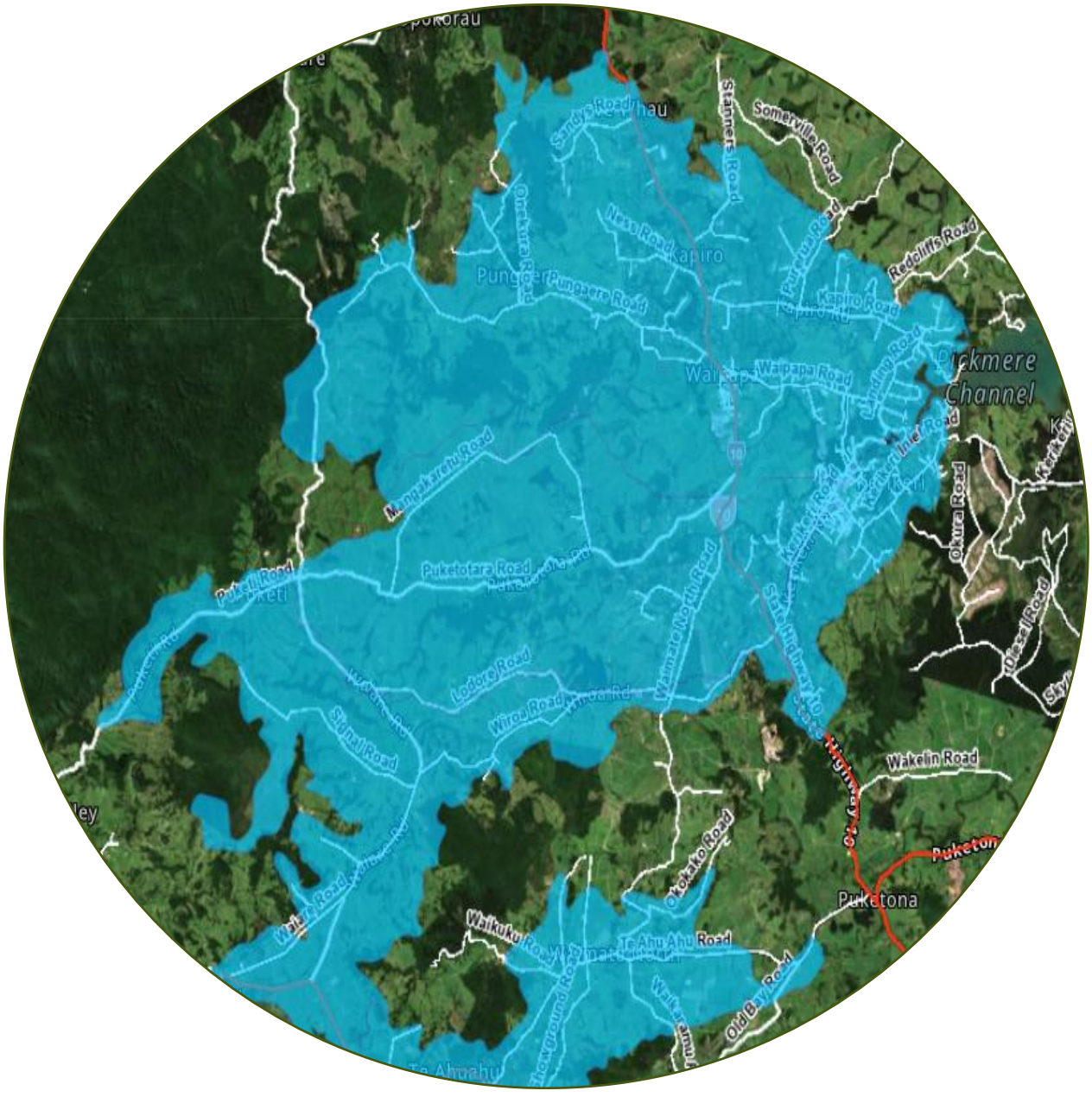
KERIKERI NITRATE INVESTIGATION 2023-2024

Northland REGIONAL COUNCIL
Te Kaunihera ā rohe o Te Taitokerau



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Recommended Citation:

Hapu, A. (2025). Kerikeri Nitrate Investigation 2023-2024. Northland Regional Council report.

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1. Introduction

Nitrate in soil can naturally occur in several ways: decay of plants, animals, organic matters, animal manure, nitrogen fertilizer and rain.

Plants can take up nitrate in soil through their root system. However, when there is an excess amount of nitrate in the soil, rain will cause it to leach downward through the soil into the groundwater.

Nitrates become a concern when they exceed the Maximum Acceptable Value (MAV) established by drinking water standard of New Zealand (DWSNZ) for safe drinking water by humans. The MAV for nitrate, when it is reported as **nitrate-nitrogen** is set at 11.3 milligram per litre (mg/L).

Use of nitrogen fertilisers has been identified as one of the potential sources for elevated nitrate levels in groundwater (Selvarajah et al.,1994). In Kerikeri large areas are used for horticulture and use of nitrogen fertilizer may not be uncommon.

There is no specific information on nitrate concentrations in groundwater around Kerikeri, especially areas where horticulture is dominant. Therefore, council has implemented a nitrate monitoring programme to obtain baseline data on nitrate in groundwater around Kerikeri.

1.1 Purpose of the report

The purpose of this report is to provide:

- Details of design of nitrate monitoring programme; and
- Assess concentration of nitrate in groundwater from water samples collected from selected bores.

2. Sampling Programme

The Methodology which includes the site selection, sampling method and sample analysis used in this study is given below.

2.1 Site Selection

A bore database search followed by a field visit was undertaken to identify availability and suitability of bores for sampling work. For a bore to be suitable it needs integrity, easy access, availability of power, well security and well head protection. Bore depth was not considered during site selection process due to the limited number of bores found in the area met with the suitable criteria.

It is to be noted here that some of the bores selected in the initial bore database search were not identified during the initial field visit due to either inaccurate bore locations or bore owners not being available at the time of the survey.

However, during subsequent site visits to the area for sampling, some new suitable bores were found and included in the sampling programme.

Details of the bores sampled during this study are summarised in Table 1. Sampling site locations are shown in figure 1.

Table 1: Bore details.

Aquifer	Bore number	Bore depth(m)	Screen Interval	Purpose	Location	Sampling site Number
Kerikeri	305503	58	49m - 58m	domestic	40B Stanners Rd	LOC.336804
Kerikeri	210438	24	Open from 7.3m	domestic	37F McCaughan Rd	LOC.336805
Kerikeri	340976	33	-	domestic	15 Tareha Place	LOC.106728
Kerikeri	325562	69	57m - 69m	domestic	60 Waitotara Drive	LOC.336816
Kerikeri	321381	61.5	43.5m - 61.5m	domestic	81 Waitotara Drive	LOC.336809
Kerikeri	309267	23	11m - 23m	domestic	17 Awhitu Rd	LOC.336806
Kerikeri	326665	31.9	25m - 31.9m	domestic	25 Pungaere Rd	LOC.336876
Kerikeri	307917	91	Open from 71m	Industrial	1945B SH10(Pataka Lane)	LOC.336817
Kerikeri	210281	13	Open from 5.5m	domestic	78 Rangitane Loop Rd	LOC.336941
Kerikeri	339812		-	School	23 Riverview Rd	LOC.338579
Kerikeri	312481	62	Open from 13.5m	domestic	88 Reinga Rd	LOC.338280
Wairoa	320787	93.5	29m - 61m	domestic	239A Kerikeri Inlet Rd	LOC.336937
Puketotara	309081	59	open from 42.5	Dom/Stock/irr	436 Wiroa Road	LOC.336896
Puketotara	324577	61	23m - 61m	Stock	828 Puketotara Rd	LOC.336897
Puketotara	307717	71.6	60m-71.6m	Stock	1124 Waiare Road	LOC.336898
Puketotara	210278	10	open from 3.3m	domestic	64 Mangakaraetu Rd	LOC.337844
Puketotara	209527	62	open from 49m	dom/stock	1715B SH10	LOC.337843

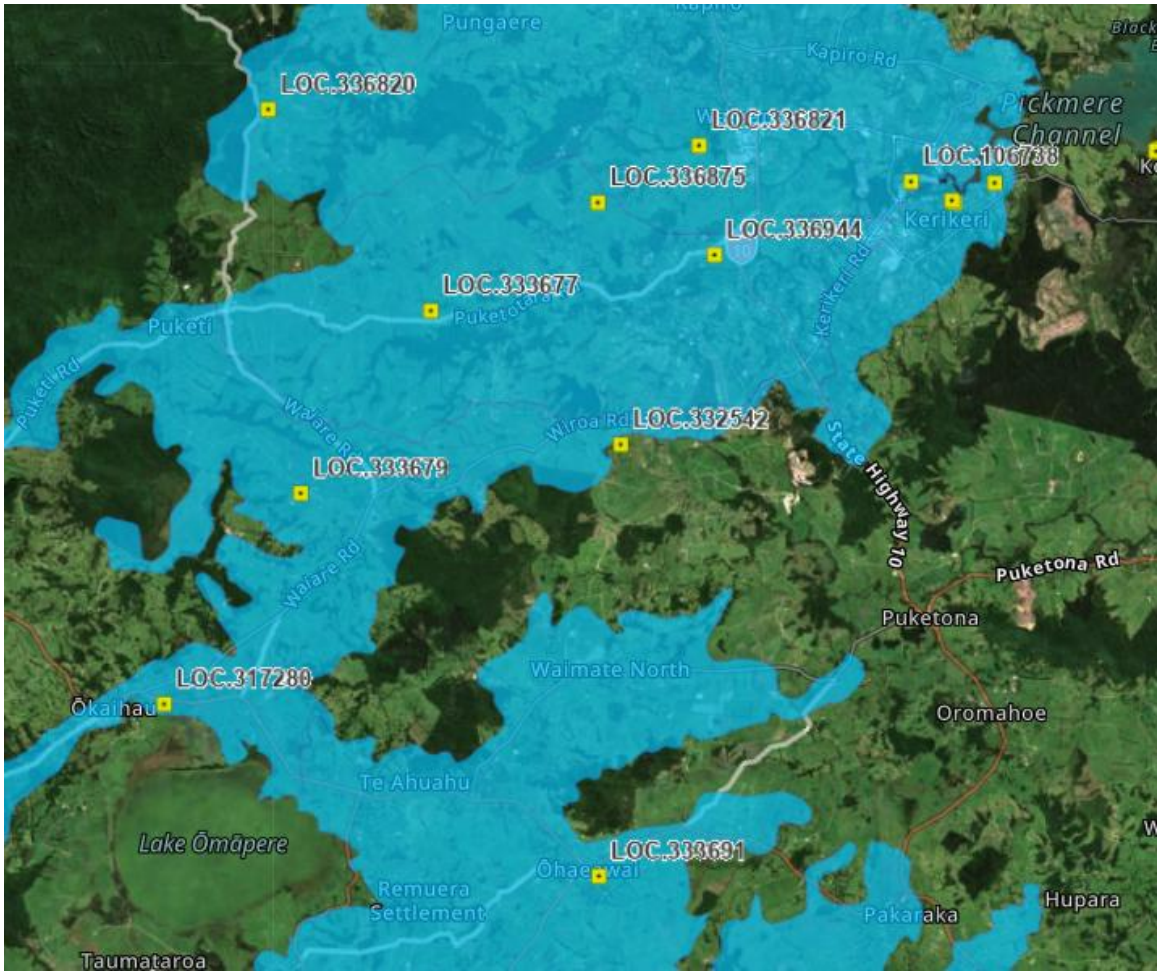


Figure 1: Map showing sampling locations of Kerikeri bores

2.2 Sampling

2.2.1 Sampling Period:

The sampling was initiated in February 2024 and completed in May 2024. Altogether, a total of 17 groundwater samples were collected under the project.

2.2.2 Collection of Samples:

Samples were collected using the guidelines provided in the National Environmental Monitoring Standards (NEMS). Purging was conducted at each site using the bore owner's pump. Purge volumes are estimated for some of the bores where bore depths are unknown.

As per the NEMS guidelines water temperature, specific conductivity and pH measurements were used to assess the adequacy of purging prior to sampling. At each site once stabilization was accomplished, final field measurements of Temperature (C^0), pH, Specific Conductance (us/cm), Dissolved oxygen (mg/L and percentage) were recorded. Water samples were then collected for nitrate nitrogen analysis.

2.2.3 Lab Analysis

Water samples collected for nitrate nitrogen analysis were sent to the Watercare laboratory in Auckland.

3. Results

Results of water quality sampling undertaken for this project are given appendix A.

3.1 Field parameters

The pH varied from 4.76 to 6.69 with an average of 5.9, indicating the acidic nature of groundwater in the area. Electrical conductivity values ranged from 62.5 us/cm to 456 us/cm with an average of 180.9 us/cm. The highest conductivity of 456 us/cm was measured at site 336941 while the lowest conductivity of 62.5 us/cm was measured at site 336896. Measured conductivity in groundwater from the bores around Kerikeri is shown in figure 2.

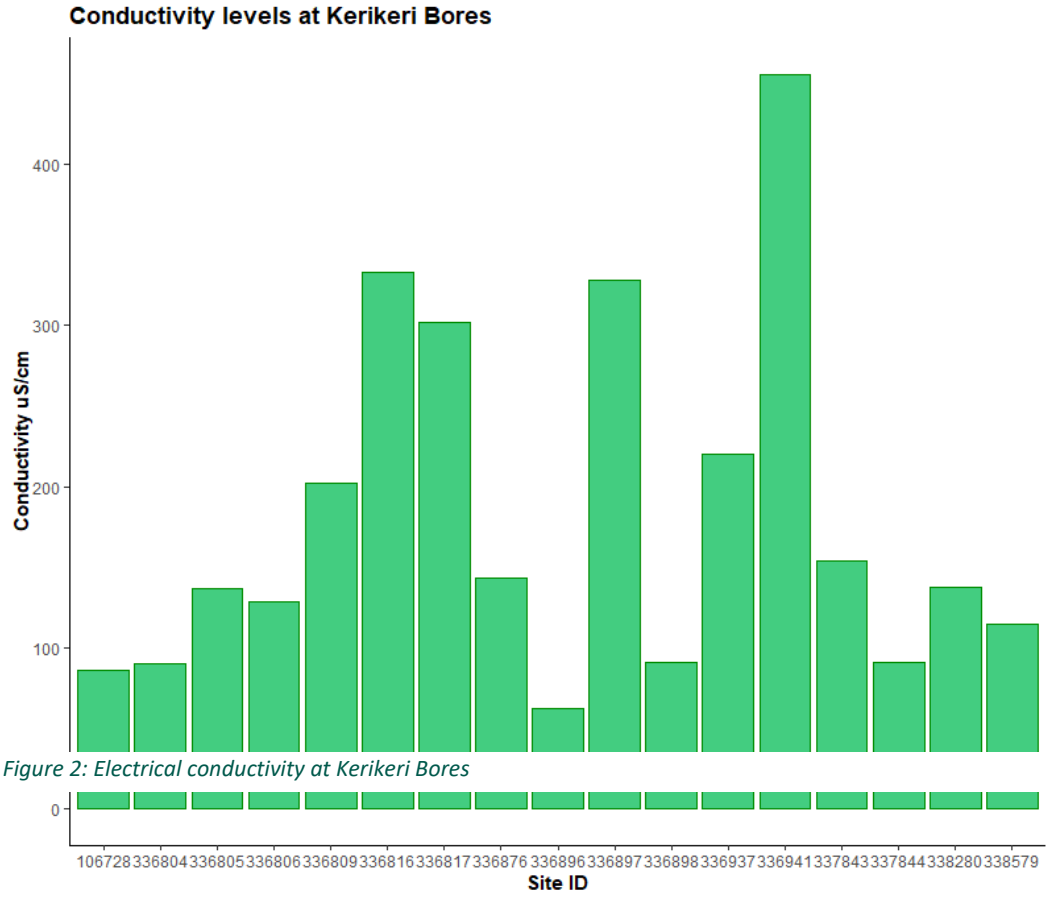


Figure 2: Electrical conductivity at Kerikeri Bores

Measured dissolved oxygen in groundwater varied in the range of 0.02 mg/L to 8.56 mg/L. Variation of dissolved oxygen levels within each site are shown in Figure 3.

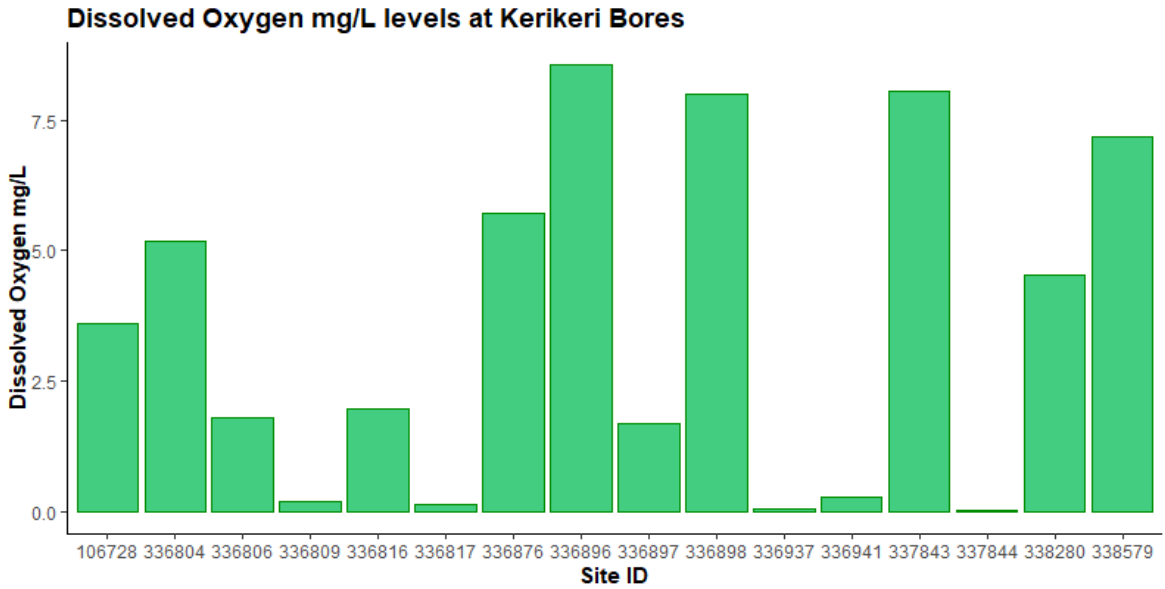
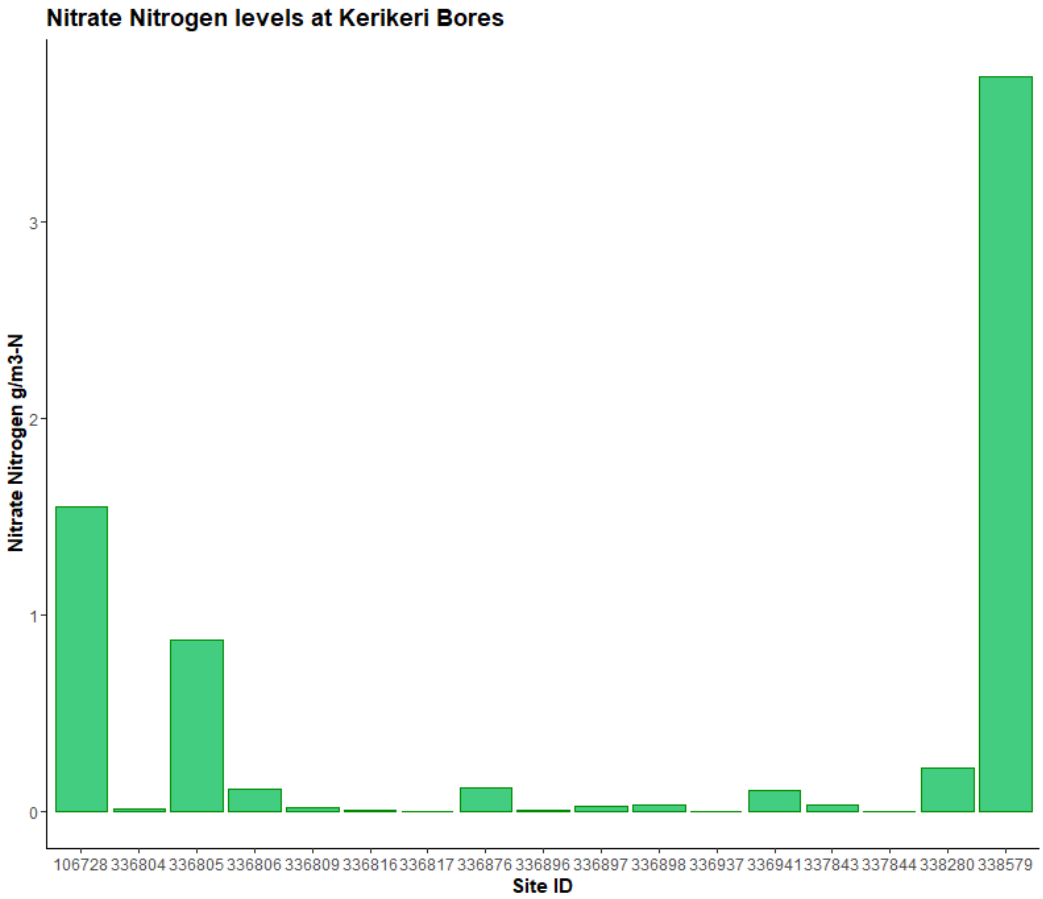


Figure 3: Plot of Dissolved Oxygen mg/L levels at Kerikeri bores

3.2 Nitrates

Nitrate-Nitrogen values ranged from 0.008 mg/L to 3.74 mg/L with an average of 0.5 mg/L. It can be seen from the figure 4 that only two sites out of seventeen sites show nitrate nitrogen level above 1.0 mg/L.



4. Discussion

Results of this study have revealed there was no nitrate pollution at all the bores sampled at Kerikeri area. In fact, most of the bores show nitrate nitrogens values well below the maximum acceptable value of 11.3 mg/L stipulated in drinking water standards for New Zealand (Ministry of Health-2005).

5. Recommendation

Due to low nitrate nitrogen concentration in groundwater in Kerikeri area, there is no immediate requirement of continuous nitrate level monitoring in groundwater in Kerikeri area.
However, it is recommended to sample these bores again in 2029 (five years period) to detect any changes in nitrate concentration in groundwater around Kerikeri.

Appendix A: Sampling results

Site ID	Comment	Conductivity at 25 deg C (uS/cm) us/cm	Depth - Groundwater mm	Dissolved Oxygen mg/L	Dissolved Oxygen Percent Saturation % Sat	Nitrate Nitrogen g/m3-N	pH pH	Temperature degC
336804	NRC pump. DO%=56.6, DO(mg/L) = 5.19	89.9	-10870	5.19	56.6	0.013	5.72	19.6
336805	No SWL-brown water cleared with pumping. No DO measured.	136.4				0.872	5.02	24.3
336816	Bore pumping on arrival. No SWL. DO% = 21.2 , DO(mg/L) = 1.96	333.1		1.96	21.2	0.008	6.38	18.8
106728	No SWL. DO% = 39.2, DO(mg/L) = 3.60	86.3		3.6	39.2	1.55	4.97	19
337844	DO % =0.4, DO(mg/L) = 0.02	91.2		0.02	0.4	<0.002	5.11	17.5
337843	Bore pumping upon arrival. DO % = 86.9, DO (mg/L) = 8.05	153.5		8.05	86.9	0.035	6.64	19.1
336817		301.9		0.14	1.6	<0.002	5.75	22.6
336806	SWL = 4.88m,	128.7	-4880	1.8	19.9	0.117	4.76	18.6
336809		202.1		0.19	2	0.02	6.69	19.5
336876		142.9		5.72	60.7	0.12	6.49	18.3
336941	No Access to measure SWL	456		0.26	2.7	0.108	6.6	18.8
338280	SWL= 17.01m. Slightly aerated water	137.8	-17010	4.53	49.2	0.22	5.74	19.4
336896	bore pumping on arrival	62.5		8.56	90.3	0.008	5.88	17.9
336897	Iron particles in the water. No SWL	327.8		1.69	17.9	0.026	6.61	18.1
338579	23 Riverview School bore. Aerated water.SWL=17.11m	114.5	-17110	7.17	76.7	3.74	6.09	18.4
336937		220.2		0.06	0.7	<0.002	6.65	19.7
336898	SWL= 29.83m	91	-29830	8	83.2	0.031	6.04	17.3

Figure 4: Nitrate Nitrogen levels at Kerikeri Bores