

Geothermal features annual monitoring report - January 2012

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1 Introduction

1.1 Background

Monitoring of the geothermal features in the Waikato Region was implemented in 1995. The aims of the monitoring are to observe the natural state of geothermal surface features and assess what changes are occurring over time, and to report on any threats or damage to the features. This will allow us to make more informed decisions to protect and enhance the geothermal resources and ecosystems.

1.2 Report Content

Geothermal monitoring is conducted quarterly, with a more extensive range of sites monitored annually. This report covers the annual monitoring from October 2011 and January 2012. The specific sites monitored for this report are as follows:

- Atiamuri
- Horohoro
- Ngatamariki
- Orakei Korako
- Reporoa
- Tauhara
- Te Kopia
- Tokaanu
- Waikite
- Waiotapu

1.3 Method

Water temperature was measured using a Fluke IR gun along with a 6m long thermocouple. Most of the GPS co-ordinates were available from previous reports. They have been converted from NZMG to NZTM co-ordinates. Where co-ordinates have not been available, a Garmin GPSmap 60CSx has been used to record locations. pH indicator paper has been used to determine pH, samples are cooled before being tested. Flow was estimated where it was visible, as was water level where it could be compared to a benchmark or was overflowing.

2 Atiamuri

2.1 Matapan Road

E1869089 N5740458; Located number 72.3005 (Hot Spring)

There are two springs here; the one on the left is the hot spring, the one on the right is the cooler spring. Measurements are also taken downstream of the springs to get a combined reading. There is green algae growing on the rocks below the spring.

Table 1: Data from the Matapan Road Spring at Atiamuri

	Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
Geothermal Spring	25 Oct 2011	66.8	7	± 5	-	-	Clear
Geothermal Spring	16 Jan 2012	61.1	7	± 5	-	-	Clear
Cool Spring	25 Oct 2011	18.9	6	± 0.5	-	-	Clear
Cool Spring	16 Jan 2012	15.8	6	± 0.5	-	-	Clear, slightly yellow
Combined Stream	25 Oct 2011	37.9	7	± 5	-	-	Clear
Combined Stream	16 Jan 2012	37.2	7	± 5	-	-	Clear



Figure 1: Matapan Road geothermal spring at Atiamuri taken in October 2011 (A & B) and January 2012 (C)

2.2 Whangapoa Pools

- Northern Pool
E1866474 N5749565; Located number 72.3004

The pool itself cannot be accessed easily; therefore the measurements are taken from the pool near the outflow. Historically, a channel has been cut.

Table 2: Data from the Northern Pool at Whangapoa Pools, Atiamuri

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
25 Oct 2011	63.8	9	± 1	Overflowing	Moderate bubbling on side of pool	Cloudy, murky green-blue
16 Jan 2012	62	9	± 2	Overflowing	Upwelling	Slightly cloudy, blue/green



Figure 2: Northern Whangapoa Pool in October 2011 (A) and January 2012(B) at Atiamuri



Figure 3: Northern Whangapoa Pool outlet in October 2011(A) and January 2012(B) at Atiamuri

- Southern Pool
E1866491 N5749513; Located number 72.4387

The pool is fenced. A channel has been cut from the pool. It has a sinter apron extending about 40m from the pool outlet.

Table 3: Data from the Southern Pool at Whangapoa Pools, Atiamuri

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
25 Oct 2011	63.1	9	0.5	Overflowing	Moderate, constant single column of bubbles and steam	Clear, turquoise
16 Jan 2012	61.7	7	±1	Overflowing	Upwelling in centre of pool.	Clear, blue-green



Figure 4: Southern Pool at Whangapoa Pools in October 2011 (A) and January 2012 (B), Atiamuri



Figure 5: Sinter apron of the Southern Whangapoa Pool in October 2011 (A) and in January 2012 (B), Atiamuri



Figure 6: Outlet of the Southern Whangapoa Pool in October 2011, Atiamuri

1. Two small mud pools off Ohakuri Road
E1866296 N5749797

These are two small mud pools, which are fenced off. There was a lot of rain in January before we visited which increased the amount of water in the pool and most likely affected the temperature. The pools were almost joined together.

Table 4: Data from the two small mud pools off Ohakuri Road, Atiamuri

Date	Pool	T(°C)	pH	Flow (l/s)	Water level	Diameter (m)	Depth (m)	Ebullition	Colour
25 Oct 2011	West	77.8	7	-	0.5m below ground	0.5	-	Diffuse bubbles, constant on one end.	Brown, muddy water.
16 Jan 2012	West	32.0	7	-	Ground level	-	1	Small, constant bubbles on left	Brown, murky
25 Oct 2011	East	68.0	7	-	-	0.5	-	Intermittent, large bubbles	Clear water in mud, oily film
16 Jan 2012	East	32.2	5	-	Ground level	-	nd	Occasional bubble in centre	Brown, murky

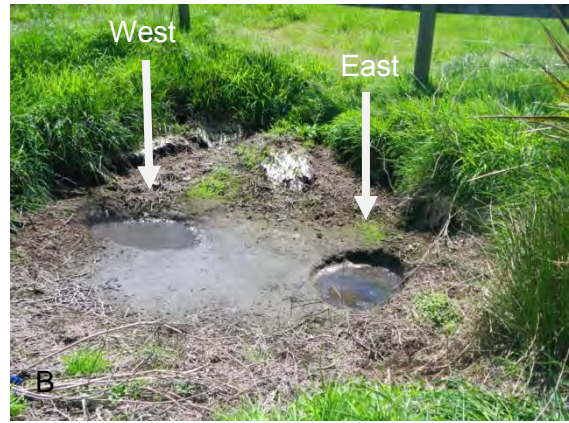


Figure 7: The two small mud pools off Ohakuri road at Atiamuri, A & B were taken in October 2011; C was taken in January 2012

- Berg's Crater
E1866162 N5749496

This feature is no longer active and has been filled with logs.



Figure 8: Photo showing Berg's Crater (October 2011), Atiamuri

3 Golden Springs

3.1 Pools in stream through the Golden Springs Motel

- North Pool
E1888747 N5736983

There were no bathers.

Table 5: Data from the North Pool at Golden Springs Motel

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
18 Jan 2012	34.1	7	30	Overflowing	-	Beige, cloudy



Figure 9: The North Pool at Golden Springs Motel

- South Pool
E1888681 N5736843

There were no bathers.

Table 6: Data from the South Pool at Golden Springs Motel

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
18 Jan 2012	36.7	7	40	Overflowing	-	Beige, cloudy



Figure 10: The South Pool at Golden Springs Motel

3.2 Pools in across the road from the Golden Springs Motel

- Feature 3
E1888846 N5737375

Table 7: Data from Feature 3 at Golden Springs

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
18 Jan 2012	41.3	7	nd	nd	Gas discharge, small constant bubbles in centre	Milky green



Figure 11: Feature 3 at Golden Springs

- Feature 4
E1888827 N5737465

Table 8: Data from Feature 4 at Golden Springs

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
18 Jan 2012	42.1	7	nd	nd	Calm	Cloudy, blue-green



Figure 12: Feature 4 at Golden Springs

4 Horohoro

4.1 Waipupumahana Pool

1878253E 5761598N; Located number 72.3006

Table 9: Data from Waipupumahana Pool at Horohoro

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
18 Jan 2012	47.9	7	± 5	Overflowing	Gentle effervescence near centre of pool and outflow	Dark green, murky



Figure 13: Waipupumahana Pool at Horohoro

5 Ngatamariki

5.1 Hydrothermal Eruption Crater

- Large pool occupying the crater
E1876505 N5730230; Located number 72.2098

There was an eruption here in April 2005, with a large amount of sediment deposited in the area. There is a large pool within the hydrothermal eruption crater, with a small mud pool alongside it. There is a lot of steam coming from the far side of the pool. Most of the pool is calm, with some areas of small bubbles, mostly around the edges. There is yellow/green algae growing around the edges and in the outlet of the pool.

Table 10: Data from Ngatamariki Hydrothermal Eruption Crater Pool

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
26 Oct 2011	49.6	9	10	Overflowing	Calm, some small bubbles. Steaming, more on far side.	Murky green
17 Jan 2012	48.8	7	10	Overflowing	Numerous small bubbles around edge and middle of pool. Steam on far side of pool.	Dark green



Figure 14: The Large Pool in the Ngatamariki Hydrothermal Eruption Crater. A) Overview of the pool(Oct 2011); B) Area of gas discharge at margin of pool (Oct 2011); C) Steam activity at far side of pool (Jan 2012); D) Outflow (Jan 2012)

- Mud pool beside large pool

There is a log in the pool.

Table 11: Data from Mud pool beside Ngatamariki Hydrothermal Eruption Crater Pool

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
26 Oct 2011	39.8	3	nd	0.5m below outflow	Continuous gas discharge	Murky grey, mud
17 Jan 2012	44.1	3	nd	0.5m below outflow	Continuous gas discharge	Murky grey, mud

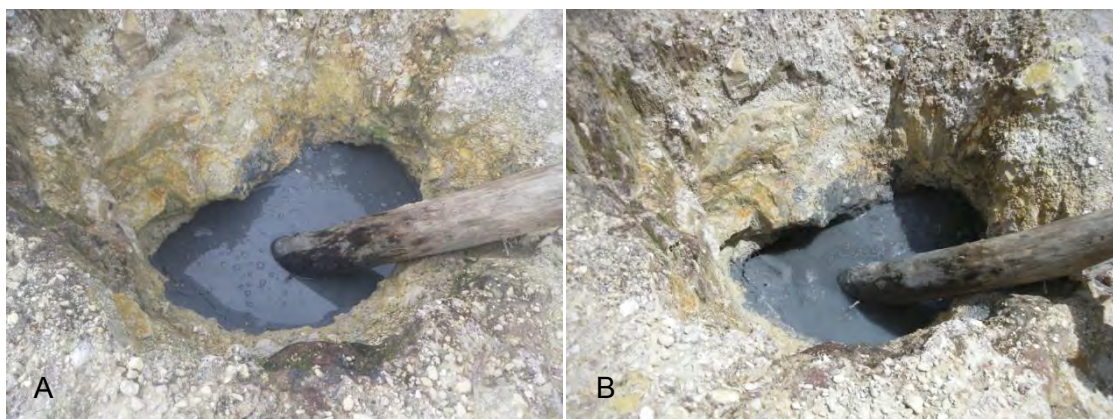


Figure 15: Mud Pool beside Ngatamariki Hydrothermal Eruption Crater Pool – A) October 2011 and B) January 2012

- Northwest Pool

There doesn't appear to be any activity in this pool. A frog was heard from within the pool. We did not visit this pool in January.

Table 12: Data from Northwest Pool at Ngatamariki

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
26 Oct 2011	25.7	7	nd	2.5m below rim	Calm	Cloudy, dark green



Figure 16: The Northwest Pool at Ngatamariki

- Biodiversity Pool

This pool is located amongst the trees to the right of the track leading to the hydrothermal eruption crater, just before the clearing. There was a thin yellow film covering part of the pool.

Table 13: Data from Biodiversity Pool at Ngatamariki

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
26 Oct 2011	71	9	nd	Top of rim	Continuous gas discharge	Clear, grey
17 Jan 2012	73.9	7	nd	nd	Constant, bubbling in centre	Clear, light grey



Figure 17: Biodiversity Pool at Ngatamariki – A) October 2011 B) January 2012

6 Orakei Korako

6.1 Orakei Korako Springs Located number 72.2107

- Diamond Geyser
E1874515 N573694

There appears to be new calcite formations around the Diamond Geyser.

Table 14: Data from the Diamond Geyser at Orakei Korako

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
25 Oct 2011	88	9	±0.5	Overflowing	Upwelling	Clear, grey tinted
17 Jan 2012	74.3	7	±0.05	Overflowing	Constant upwelling on far side of pool	Clear, dark grey



Figure 18: Diamond Geyser at Orakei Korako – A) October 2011 B) January 2012

Table 15: Data from the pool beside the Diamond Geyser at Orakei Korako

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
25 Oct 2011	84	nd	<0.5	Slight seepage	Upwelling	Milky green
17 Jan 2012	79.1	5	0 visible	0.5cm below rim	Small, constant upwelling	Dark grey, clear



Figure 19: Pool beside the Diamond Geyser at Orakei Korako – A) October 2011 B) January 2012

- Bush Geyser

The geyser did not erupt while we observed it. There appeared to have been a recent eruption in both October and January. In January there were fresh nodules and water around the geyser, and the temperature was 60.9°C within the geyser. It was steaming.



Figure 20: Bush Geysers beside Diamond Geysers at Orakei Korako – A) October 2011 B) January 2012

- Cascade Geysers

The geysers did not erupt while we observed them. In January there was one small eruption, we only saw one splash of water.



Figure 21: Cascade Geysers at Orakei Korako – A) October 2011 B) January 2012

- Sapphire Geysers

The geysers did not erupt while we were observed.



Figure 22: Sapphire Geysers at Orakei Korako

- Map of Africa
E1874578 N5736954

There are numerous growths of yellow and green algal mats.

Table 16: Data from the Map of Africa Pool at Orakei Korako

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
25 Oct 2011	46.1	9	nd	nd	Calm, some steam	Clear, green.
17 Jan 2012	47.8	9	nd	nd	Calm	Clear, dark grey

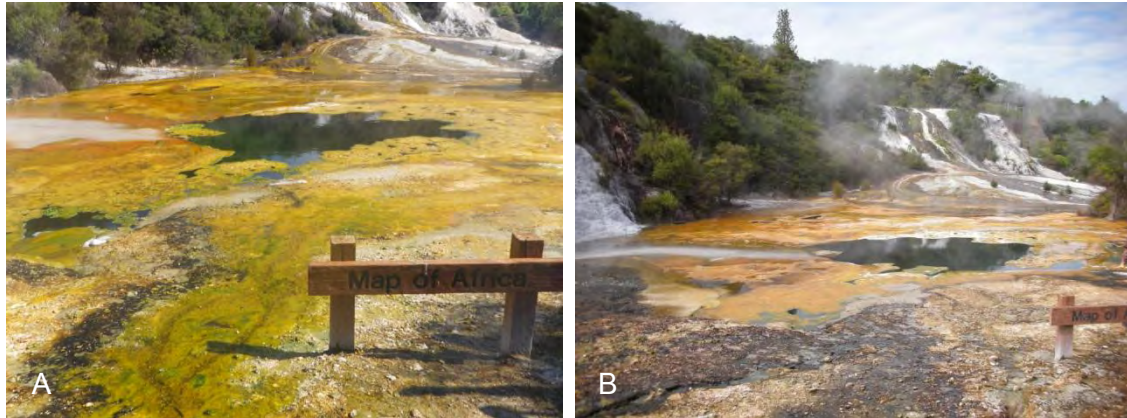


Figure 23: Map of Africa at Orakei Korako- A) October 2011 B) January 2012

- Devil's Throat
E1874599 N5736996

There doesn't appear to be any fresh sinter, therefore the chemistry may have changed. It appears to be cyclical, bubbling increased with more flow. In January, the temperature changed from 90.5°C, to 94.6°C during a surge and 99.8°C after a surge.

Table 17: Data from the Devil's Throat at Orakei Korako

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
25 Oct 2011	98	7	1-2	Overflowing	Bubbling vigorously	Clear
17 Jan 2012	99.8	7	1	Overflowing	Bubbling vigorously	Clear

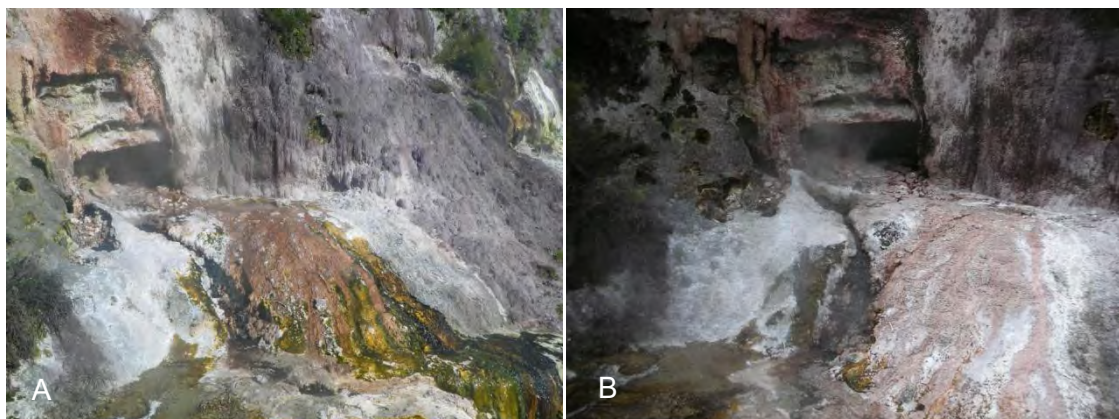


Figure 24: Devil's Throat at Orakei Korako – A) October 2011 B) January 2012

- Fred and Maggie's Pool
E1874648 N5736981

Table 18: Data from Fred and Maggie's Pool at Orakei Korako

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
25 Oct 2011	98.1	7	0.5	Overflowing	Ebullient, boiling	Clear, blue-green
17 Jan 2012	98.2	7	0.5	Overflowing	Vigorous bubbling	Clear, grey-blue

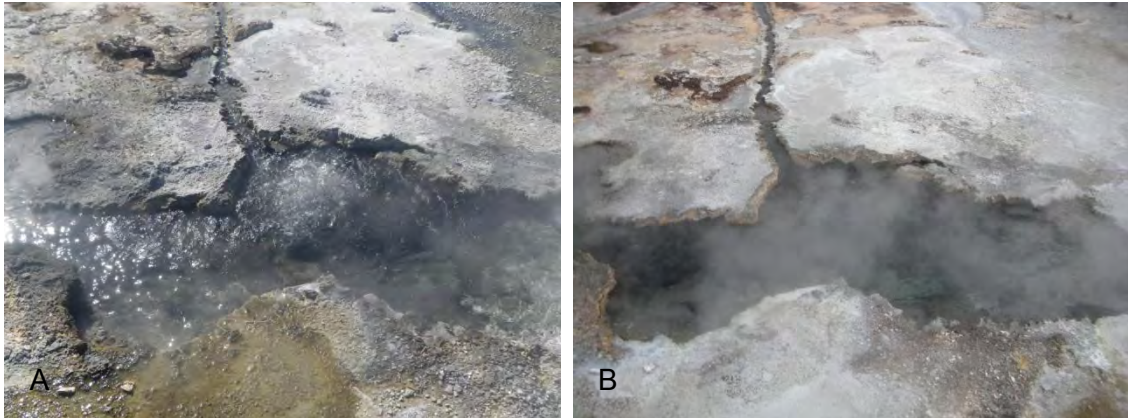


Figure 25: Fred and Maggie's Pool at Orakei Korako – A) October 2011 B) January 2012

- Golden Fleece

The temperature in the pool was 89.9°C in October 2011. We did not visit this pool in January.

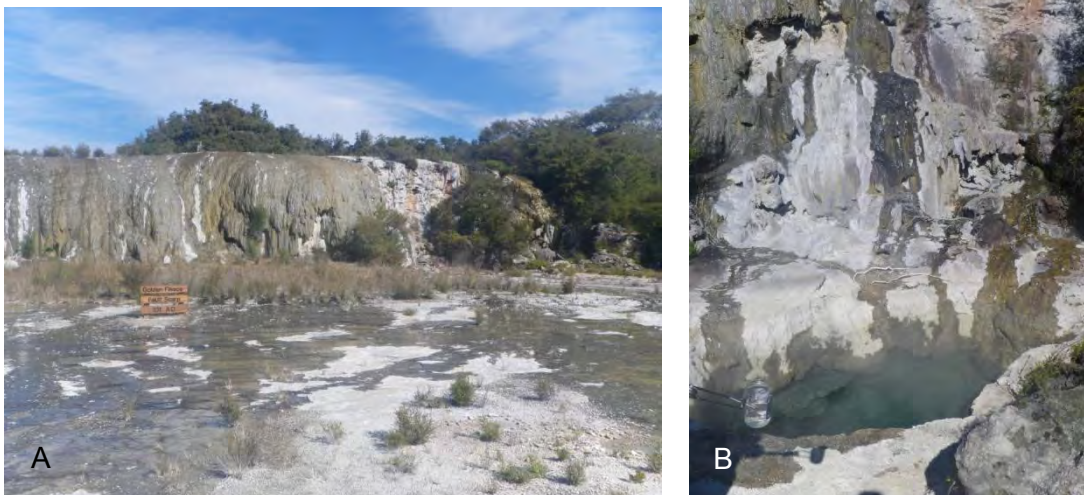


Figure 26: Golden Fleece scarp (A) and one of the pools along the scarp (B) at Orakei Korako

- Wairiri Geyser
E1874643 N5736951

Table 19: Data from the Wairiri Geyser at Orakei Korako

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
25 Oct 2011	85	7	nd	0.8m below surface	Occasional bubbles	Clear
17 Jan 2012	73.9	7	nd	1m below surface	Constant, small bubbles	Clear, grey

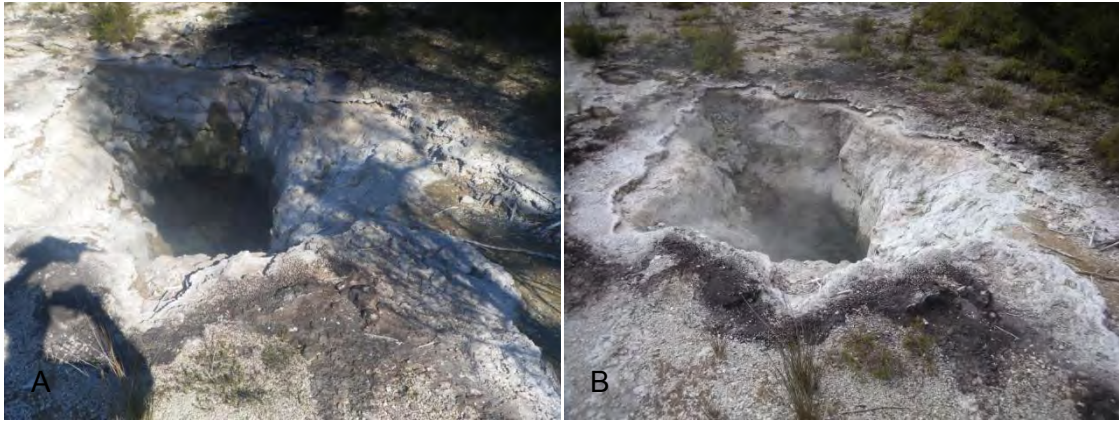


Figure 27: Wairiri Geyser at Orakei Korako – A) October 2011 B) January 2012

- Steaming ground on the Western edge of Artists Palette.
E1874661 N5736910

In October there was water on the ground where it is usually steaming. In January the ground was dry and the hottest area was closest to the boardwalk.

Table 20: Data from the steaming ground on the Western edge of Artists Palette at Orakei Korako

Date	T(°C)
25 Oct 2011	35
17 Jan 2012	23 - 61

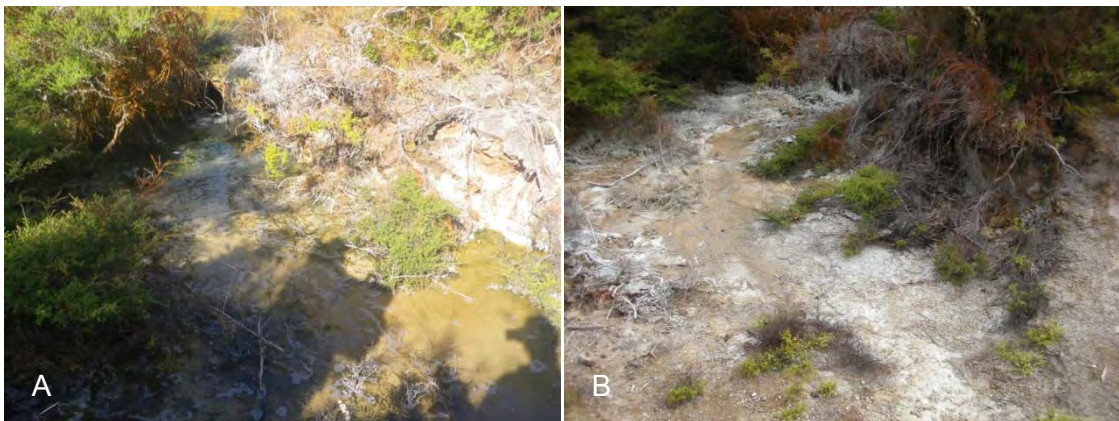


Figure 28: Steaming ground on the Western edge of Artists Palette at Orakei Korako – A) October 2011 B) January 2012

- Fumarole to left of boardwalk
E1874662 N5736878

There was no water in the fumarole in both October and January. The fumarole has a depth of about 0.5m, and a diameter of 1.0m x 0.7m. There was weak steam emanating from the fumarole in January, and a temperature of 48.4 was measured using the IR gun.



Figure 29: Fumarole to the left of the boardwalk at Orakei Korako

- Two pools by the boardwalk
E1874670 N5736770

Table 21: Data from the South Pool by the boardwalk at Orakei Korako

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
25 Oct 2011	54.2	4	nd	0.5 below surface	Some gas discharge.	Murky green/grey
17 Jan 2012	74.1	5	0 visible	3m below surface	Slow, constant bubbles	Grey, cloudy

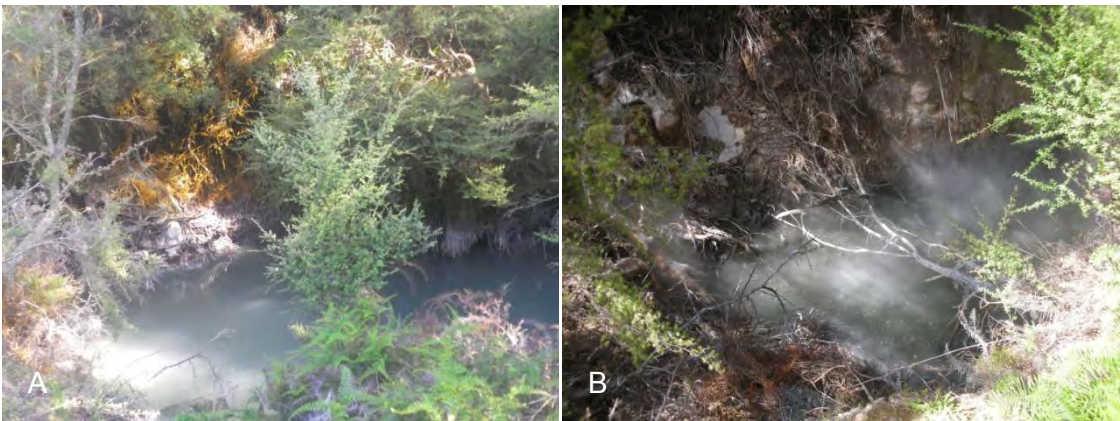


Figure 30: South Pool by the boardwalk at Orakei Korako- A) October 2011 (B) January 2012

Table 22: Data from the North Pool by the boardwalk at Orakei Korako

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
25 Oct 2011	49.4	7	nd	0.5m below surface	Some gas discharge.	Slightly murky green
17 Jan 2012	71.8	nd	O visible	1.5m below surface	Constant bubbling	Clear, light grey



Figure 31: North Pool by the boardwalk at Orakei Korako

- Artists Palette and Pyramid of Geysers

October 2011:

50m to left of Pyramid Geyser there is continuous activity (bubbling). The geyser in front of the pyramid geyser is going vigorously – continuous activity / geysering upflow. The small pool 50m from the platform is vigorously bubbling.

January 2012:

The pools on the left of the lookout are bubbling vigorously. The pool on the far side of Artists Palette, to the left of the main geyser is also bubbling vigorously. The geyser in front of the lookout erupted while we were there. It was around 0.3m – 0.5m high, and erupted for 2mins30secs. The pyramid geyser was continuously erupting at 0.5m – 1m in height.

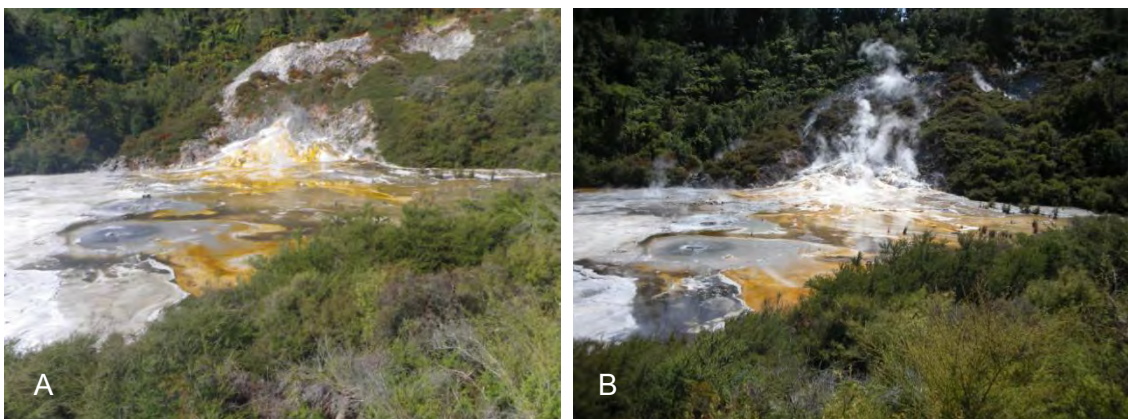


Figure 32: Artists Palette at Orakei Korako, with the Pyramid of Geysers in the background – A) October 2011 B) January 2012



Figure 33: Composite photo of Artists Palette at Orakei Korako and the Pyramid of Geysers in October 2011 (A) and January 2012 (B)

- Ruatapu Cave
E1874752 N5736770

We couldn't get down to pool due to the rock fall hazard.

Table 23: Data from the Ruatapu Cave at Orakei Korako

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
25 Oct 2011	nd	nd	0	Low	Calm	Clear
17 Jan 2012	nd	nd	0 visible	Low	Calm	Clear



Figure 34: Ruatapu Cave at Orakei Korako

- Soda Fountain
E1874555 N5736924

Table 24: Data from the Soda Fountain at Orakei Korako

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
25 Oct 2011	98.7	9	±0.5	Overflowing	Very vigorous bubbling at back. Steaming.	Clear, blue-green
17 Jan 2012	97.6	9	1	Overflowing	Vigorous upwelling. Steaming.	Clear, blue-grey

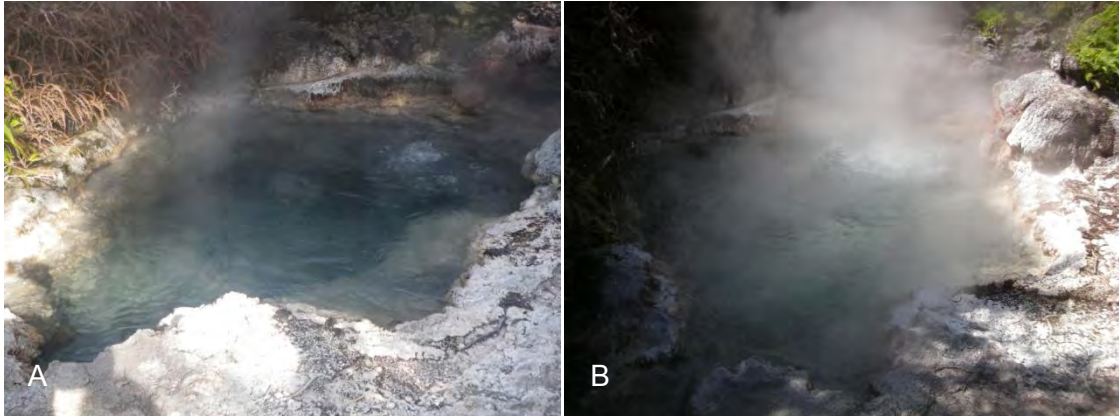


Figure 35: Soda Fountain at Orakei Korako – A) October 2011 B) January 2012

- Map of Australia
E1874160 N5736976; Located number 72.2998

Trees are falling into the pool on the far side in October. Trees had been cleared in January.

Table 25: Data from the Map of Australia at Orakei Korako

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
25 Oct 2011	80.6	9	<0.5	98mm below top of ruler	Calm, minimal bubbling around edge.	Clear, blue
17 Jan 2012	82.0	7	0 visible	255mm below top of ruler	Constant, slow bubbling on far side	Clear, blue-green

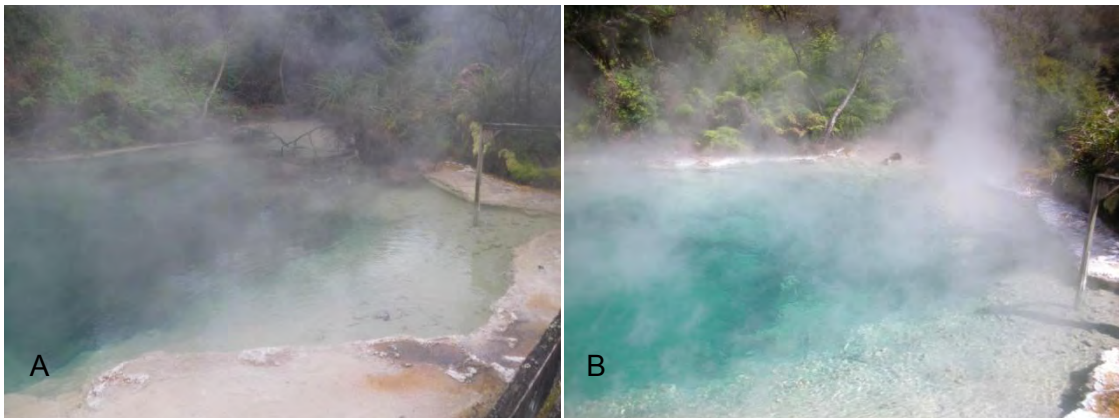


Figure 36: Map of Australia at Orakei Korako in October 2011 (A) and January 2012 (B)

6.2 Waihunuhunu Inlet

- Inlet 1
E1875427 N5739204

There were four bathers, plus an additional two people on a boat.

Table 26: Data from Inlet 1 at Waihunuhunu Inlet, Orakei Korako

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
17 Jan 2012	41.2	7	±20	-	-	Clear

- Inlet 2
E1875395 N5746213

There were four bathers.

Table 27: Data from Inlet 2 at Waihunuhunu Inlet, Orakei Korako

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
17 Jan 2012	45.0	7	15-20	-	-	Clear



Figure 37: Waihunuhunu Inlet 1 (A) and Inlet 2 (B), Orakei Korako

7 Reporoa

7.1 Butcher's Pool

- E1891720 N5738576

There was an oily, yellow film and algae floating on top of the water.

There were no bathers.

Table 28: Data from Butcher's Pool at Reporoa

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
18 Jan 2012	39.1	7	-	0.5m below rim	Effervescing all over pool	Murky, light green



Figure 38: Butcher's Pool at Reporoa

7.2 Wharepapa Road

- Fumaroles
E1890802 N5742769

Table 29: Data from Fumaroles at Reporoa

Date	Vent	T(°C)	Flow	Depth (m)	Diameter (m)	Ebullition	Colour
18 Jan 2012	1	49.8	steam	±0.8	±0.2	Audible gas discharge	Black mud
18 Jan 2012	2	60.1	steam	±1.0	±0.5	Audible gas discharge, bubbling mud	Black mud
18 Jan 2012	3	70.1	steam	±1	±0.3	Audible gas discharge, bubbling mud	Black mud
18 Jan 2012	4	61.1	steam	±1.5	±1.0 x 0.5	Audible gas discharge	Black mud
18 Jan 2012	5	61.1	steam	±0.3	±0.3	Audible gas discharge, bubbling mud	Black mud
18 Jan 2012	6	79.9	steaming ground	ground level	±0.3	nd	nd



Figure 39: Fumaroles at Reporoa. A) Overview of Fumaroles; B) Vents 1 & 2; C) Vent 3; D) Vent 4; E) Vent 5; F) Vent 6

- Figure 8 shaped pools
E1890786 N5742843

The pools have merged. The larger pool is more active, and the pH appears to be different between the pools.

Table 30: Data from Figure 8 shaped pools at Reporoa

Date	Pool	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
18 Jan 2012	Large	86.7	7	nd	0.2m below ground	Upwelling, gas discharge	Clear, dark grey/brown mud base
18 Jan 2012	Small	81.5	9	nd	0.2m below ground	Calm	Clear, grey/brown mud base



Figure 40: Figure 8 shaped pools at Reporoa

- Hot Pool 3
E2800959 N6304325

This pool has now been fenced off.

Table 31: Data from Hot Pool 3 at Reporoa

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
18 Jan 2012	86.7	9	±5	0.3m below rim	Slow, constant upwelling	Clear, blue



Figure 41: Hot pool 3 at Reporoa

- Hot Pool 4
E1891154 N5743025

The pool appears to have a muddy base. There were several areas of steaming ground around the pool.

Table 32: Data from Hot Pool 4 at Reporoa

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
18 Jan 2012	67.8	4	nd	0.1m below rim	Constant bubbling, audible gas discharge	Murky, grey



Figure 42: Hot Pool 4 at Reporoa

8 Tauhara

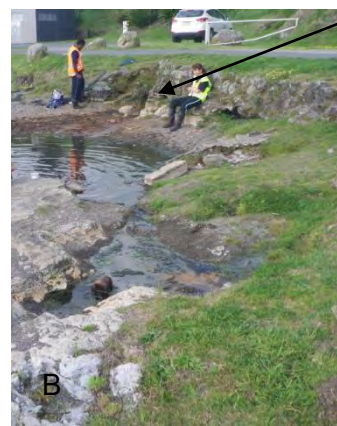
8.1 Lake Taupo Shore

- Taharepa Spring
E1882989 N5733159; Located number 1197.1

Apart from the main Taharepa Spring, there are several small springs feeding into the main pool. There appeared to be an oily film over several areas of the pool in October, and some thick green algae growing on the far side. In October we were at the spring at 17:00, and there were two bathers. In January there were four bathers at 15:30.

Table 33: Data from the Taharepa Spring at Tauhara

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
26 Oct 2011	64.3	7	seep	nd	No gas	Clear, oily slick in pools
16 Jan 2012	64.2	7	seep	nd	No gas	Clear



Taharepa Spring

Figure 43: Taharepa Spring at Tauhara in January 2012 (A) and October 2011 (B)

- Rocky Point Spring
E1868286 N5711795; Located number 72.2988

The water level from the lake was above the level of the spring on both occasions, which would have affected the results. The water was clear and warm with a little steam. There were no bathers next to the spring in October or January.

Table 34: Data from the Rocky Point Spring at Tauhara

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
26 Oct 2011	-	-	-	nd	No gas, little steam	Clear
18 Jan 2012	34.6	7	-	nd	Calm	Clear



Figure 44: Rocky Point Spring at Tauhara

8.2 Otumuheke

- End of Ponga
E1869102 N5715081

There was green algae on the stream bed. The site is at the end of the ponga fence next to the Spa Hotel.

Table 35: Data from the Otumuheke Stream at the end of the Ponga fence, Tauhara

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
26 Oct 2011	51.1	7	±50	nd	No gas	Clear
18 Jan 2012	53.6	7	±50	nd	No gas	Clear



Figure 45: Otumuheke Stream at Tauhara in October 2011 (A) and January 2012 (B)

- Confluence under bridge

There was algae on the bed of both streams. The site is located on the bridge next to the Spa Hotel. There is brown/yellow sediment on the bed of the right tributary.

Table 36: Data from the right tributary to the Otumuheke Stream by the bridge, Tauhara

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
26 Oct 2011	47.8	7	±0.5	nd	No gas	Clear
18 Jan 2012	52.9	7	±1	nd	No gas	Clear

Table 37: Data from the Otumuheke Stream by the bridge, Tauhara

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
26 Oct 2011	50.7	7	±40	nd	No gas, some steam.	Clear
18 Jan 2012	54.5	7	±40	nd	No gas	Clear



Figure 46: Otumuheke Stream at Tauhara, with the tributary on the right

- Spa Thermal Park

The Otumuheke Stream runs into the Waikato River in Spa Thermal Park. In January 2012 at 16:00, there were 39 bathers, 2 kayakers, 2 dogs and 16 people walking down to the pools.



Figure 47: Otumuheke Stream at Spa Thermal Park (Tauhara)

8.3 Waipahihi Source

- Source Spring
E1869804 N5711669; Located number 72.2989

Table 38: Data from the Waipahihi Source Spring at Tauhara

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
26 Oct 2011	70.5	9	Seep	Overflowing	No gas, steam.	Clear, grey
18 Jan 2012	70.3	7	Seep	Overflowing	No gas, steam	Clear, grey



Figure 48: Waipahihi Source Spring at Tauhara

- New Spring

This is a new spring that has formed near the weir. There are new deposits of exposed sinter. There is yellow/green algae growing in the water.

Table 39: Data from the New Spring at Waipahihi, Tauhara

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
26 Oct 2011	69.0	9	<0.5	nd	No gas	Clear
18 Jan 2012	69.8	7	<0.5	nd	No gas	Clear

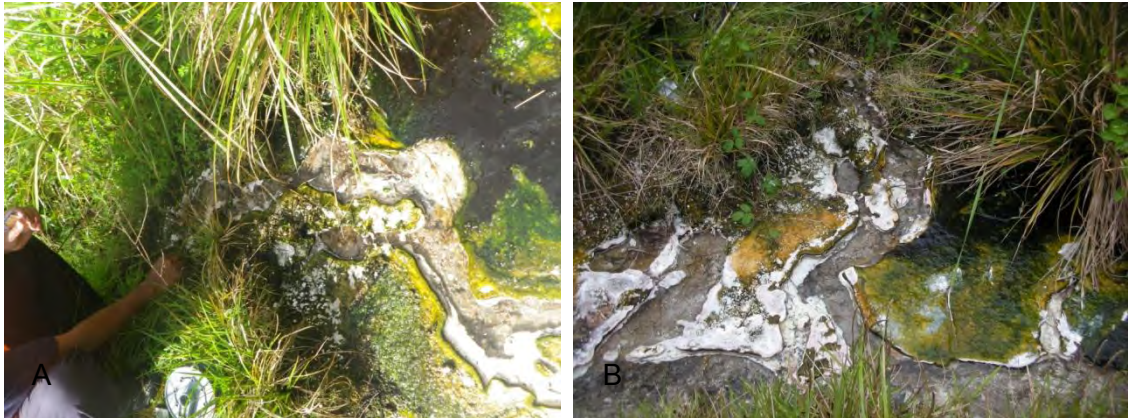


Figure 49: New Spring at Waipahihi, Tauhara in October 2011 (A) and January 2012 (B)

9 Te Kopia

Located number 72.2117

9.1 Mud Geyser and associated pools

- Large pool and mud volcano
E1880802 N5744756

In October we could not measure the temperature as we did not have an IR gun. There appeared to have been a recent eruption in the mud volcano. The far side of the volcano had collapsed. In January there did not appear to have been a recent eruption.

Table 40: Data from the large pool and mud volcano at Te Kopia

Date	Pool	T(°C)	Flow (l/s)	Depth to water	Ebullition	Colour
27 Oct 2011	Large Pool	nd	nd	±5	Gas discharge	Light grey mud
27 Oct 2011	Mud Volcano	nd	nd	±0.5	Continuous gas discharge.	Light grey mud
17 Jan 2012	Large Pool	84.8	nd	±5	Constant gas discharge	Light grey mud
17 Jan 2012	Mud Volcano	78.1	nd	±0.5	Continuous gas discharge	Light grey mud



Figure 50: Large Pool (A) and Mud Volcano (B) at Te Kopia in October 2011 and the Large Pool (C) and Mud Volcano (D) in January 2012

- Large Pool and Mud Geyser on Geyser Ridge
E1880758 N5744696

In October 2011, the water level appeared to be high, and had therefore flooded the mud geyser. There was steam coming off the water and there were several areas of upwelling. The situation was the same in January, however we did manage to get the

temperature in the Large Pool, which was 79.1°C. There was also some vigorous bubbling around the edge. The water was grey and cloudy.

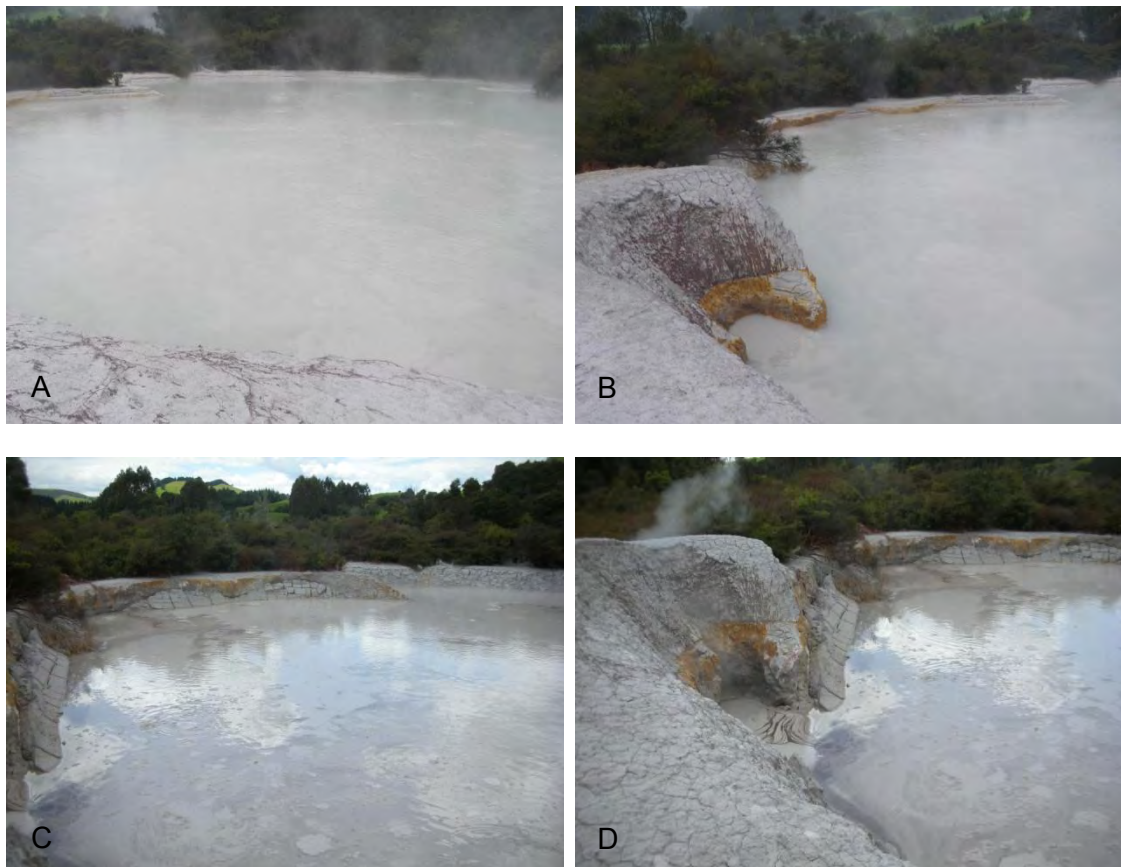


Figure 51: Large Pool (A) and Mud Geyser (B) on Geyser Ridge at Te Kopia in October 2011 and the Large Pool (C) and Mud Geyser (D) in January 2012

- Small Mud Pool on Geyser Ridge
E1880750 N5744694

There appeared to have been a recent eruption in January 2012.

Table 41: Data from the small mud pool on Geyser Ridge at Te Kopia

Date	T(°C)	Flow (l/s)	Depth (m)	Diameter (m)	Ebullition	Colour
27 Oct 2011	nd	Steam	0.5	±1.5 x 2	-	Light grey mud
17 Jan 2012	61.1	Steam	0.5	±1.5 x 2	Gas discharge	Light grey mud



Figure 52: Small mud pool on Geyser Ridge at Te Kopia in October 2011 (A) and January 2012 (B)

10 Tokaanu

10.1 Tourist Walk

Located number 72.2119

- Hydrothermal Eruption Pool beside Te Waihoto Pool
E1839504 N5683191

There is new vegetation growing around the pool, comprising of Coprosma and Manuka. In January there was green algae growing in the pool.

Table 42: Data from the Hydrothermal Eruption Pool beside Waihoto Pool at Tokaanu

Date	T(°C)	pH	Flow (l/s)	Water level	Diameter (m)	Ebullition	Colour
28 Oct 2011	55.6	7	0	0.4m below ground level	±1.5	Calm	Clear, light brown
20 Jan 2012	55.1	6.5	0	0.4m below ground level	±1.5	Calm	Clear, brownish.



Figure 53: Hydrothermal Eruption Pool beside Waihoto Pool at Tokaanu in October 2011 (A) and January 2012 (B)

- Matewai Pool
E1836520 N5683146

In October the water level was almost at the top of the lip separating the two pools. In January the level was about 0.5m below the rim, covering the lip between the pools.

Table 43: Data from the Matewai Pool at Tokaanu

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
28 Oct 2011	70.5	7	2.5 (inflow)	1.2m below ground level	Calm	Clear, slightly brown
20 Jan 2012	69.3	7	2 (inflow)	0.5m below rim	Calm, some steam	Clear, green-blue

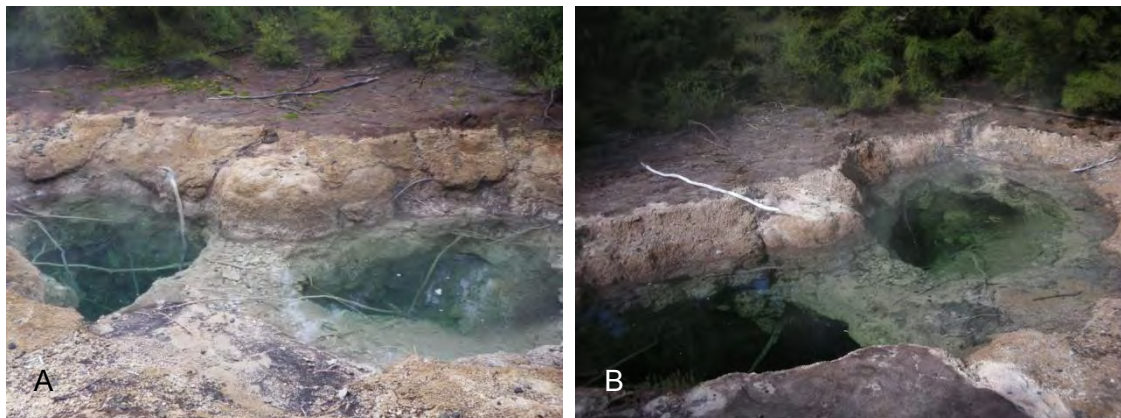


Figure 54: Matewai Pool at Tokaanu in October 2011 (A) and January 2012 (B)

- Hoani Pool A
E1839510 N5683138

The outflow to Matewai Pool is a long standing artificial channel that has been dug under the path.

Table 44: Data from the Hoani Pool A at Tokaanu

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
28 Oct 2011	84.0	7	2.5	Ground level	Calm, small bubbles on left	Clear, light brown
20 Jan 2012	84.7	7	2	Ground level	One area of upwelling	Clear, greenish

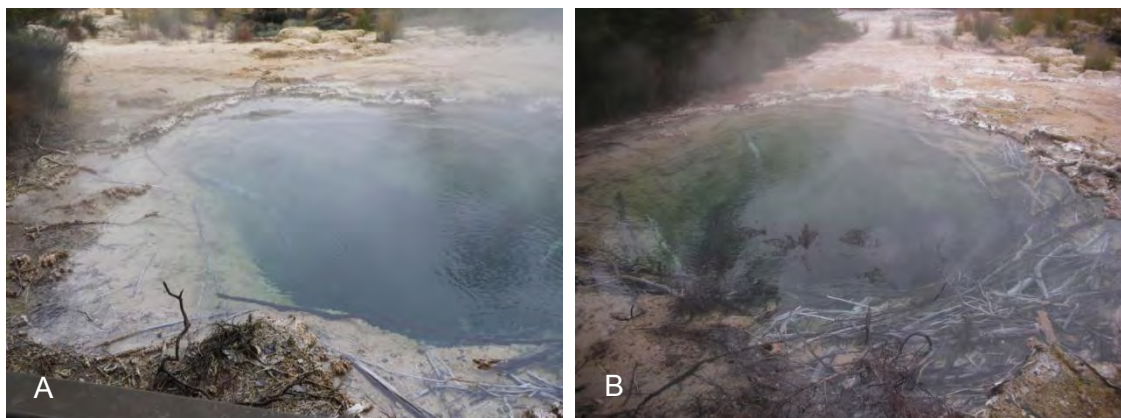


Figure 55: Hoani Pool A at Tokaanu in October 2011 (A) and January 2012 (B)

- Hoani B Pool
E1839499 N5683134

Table 45: Data from Hoani Pool B at Tokaanu

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
28 Oct 2011	81.0	7	0	40cm below o/flow	Calm	Clear, light brown
20 Jan 2012	74.5	7	0	10cm below o/flow	Calm, some steam	Clear, blue-green



Figure 56: Hoani Pool B at Tokaanu in October 2011 (A) and January 2012 (B)

- Hoani C Pool
E1839499 N5683134

Visibility is about 20cm.

Table 46: Data from Hoani Pool C at Tokaanu

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
28 Oct 2011	39.0	7	0	50cm below o/flow	Minor, in middle	Muddy brown
20 Jan 2012	43.5	5	0	30cm below o/flow	Calm, with minor effervescence	Murky brown



Figure 57: Hoani Pool C at Tokaanu in October 2011 (A) and January 2012 (B)

- Takarea 6 Pool
E1839676 N5683088; Located number 72.2985

Table 47: Data from Takarea 6 Pool at Tokaanu

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
28 Oct 2011	56.3	7	Overflowing, diffuse, can't be measured	Ground level	Calm	Clear, light brown
20 Jan 2012	61.6	7	0 visible	Ground level	Calm, small bubbles around edge	Clear, greenish



Figure 58: Takarea 6 Pool at Tokaanu in October 2011 (A) and January 2012 (B)

- Takarea 5 Pools
E1839380 N5683090; Located number 72.2985

Table 48: Data from Takarea 5 Pools at Tokaanu

Date	Pool	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
28 Oct 2011	East	55.4	7	Overflowing all round	Ground level	Moderate from deepest part	Clear, light brown
20 Jan 2012	East	58.3	7	Overflowing	Ground level	Strong upwelling in centre, some bubbles around edges	Clear, green
28 Oct 2011	West	40.7	6.5	Overflowing	Ground level	Moderate, in middle	Clear, mid-brown
20 Jan 2012	West	46.4	6.5	Overflowing	Ground level	Strong upwelling in centre, some bubbles around edges	Murky brown

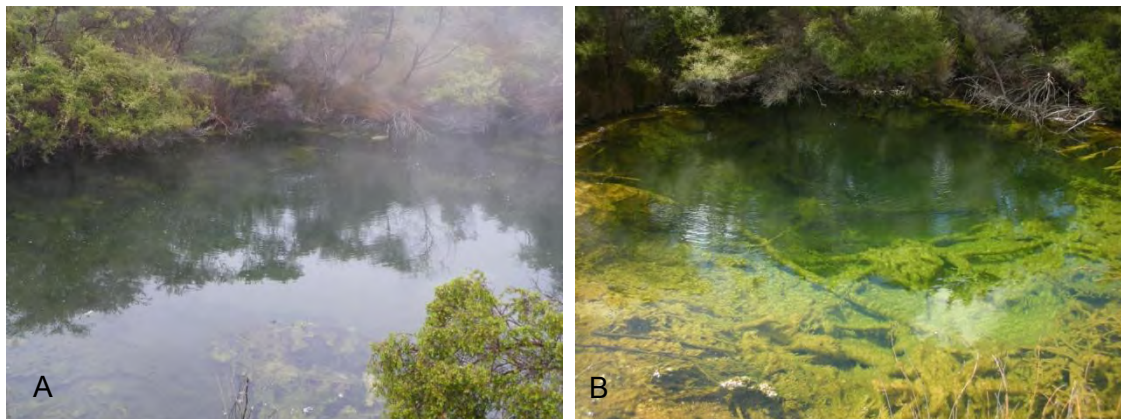


Figure 59: Takarea 5 East Pool at Tokaanu – October 2011 (A) and January 2012 (B)

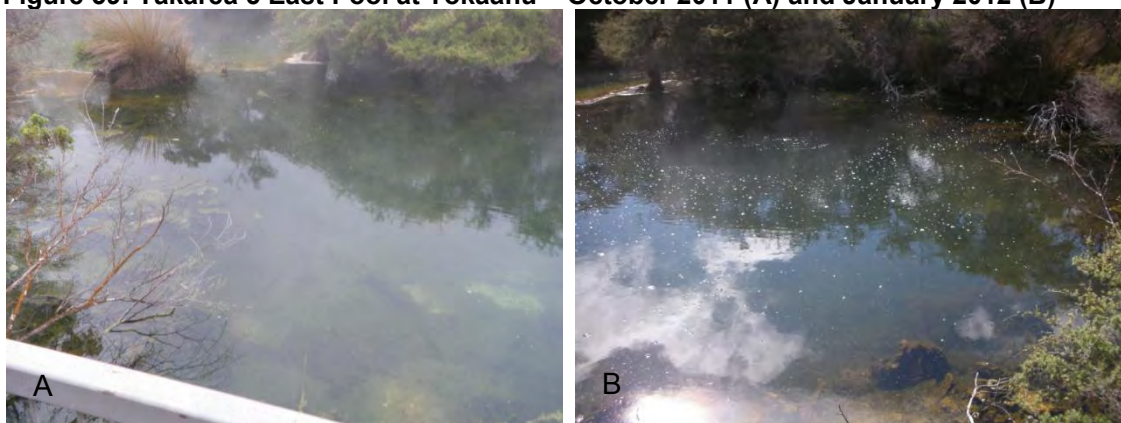


Figure 60: Takarea 5 West Pool at Tokaanu in October 2011 (A) and January 2012 (B)

- Takarea Pool

This is a small bubbling pool by the corner of the path between East and West Pools. It was not monitored in January 2012.

Table 49 : Data from the Takarea Pool at Tokaanu

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
28 Oct 2011	42.0	7	1 l/s	O/f	Moderate	Clear, brown



Figure 61: Takarea Pool at Tokaanu

- Te Ngutu Pool
E1839353 N5683079

Table 50: Data from Te Ngutu Pool at Tokaanu

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
28 Oct 2011	44.2	7	1 l/s from Toretiti	25cm below o/flow, 35cm below boardwalk	Very minor	Clear, dark black
20 Jan 2012	54.4	5	0.5	Ground level	Calm	Clear



Figure 62: Te Ngutu Pool at Tokaanu

- Toretiti Pool
E1839353 N5683079

A large Kanuka tree by fence has fallen across the pool. Visibility in the pool is about 40cm.

Table 51: Data from Toretiti Pool at Tokaanu

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
28 Oct 2011	57.8	7	1 l/s to Ngutu	Ground level	Moderate	Brown
20 Jan 2012	30.6	5	0.25 from Ngutu	Ground level	Calm	Clear



Figure 63: Toretiti Pool at Tokaanu

Mud Pools close to Paurini
E1839332 N5683066

- Mud Pool 1

Table 52: Data from Mud Pool 1 at Tokaanu

Date	T(°C)	Liq discharge (l/s)	Diameter (m)	Ebullition	Colour
28 Oct 2011	42.0	0	1.2 x 0.5m	Bubbling lightly	Dark brown mud
20 Jan 2012	94.1	0	1 x 0.5m	Two areas of bubbling	Dark brown mud

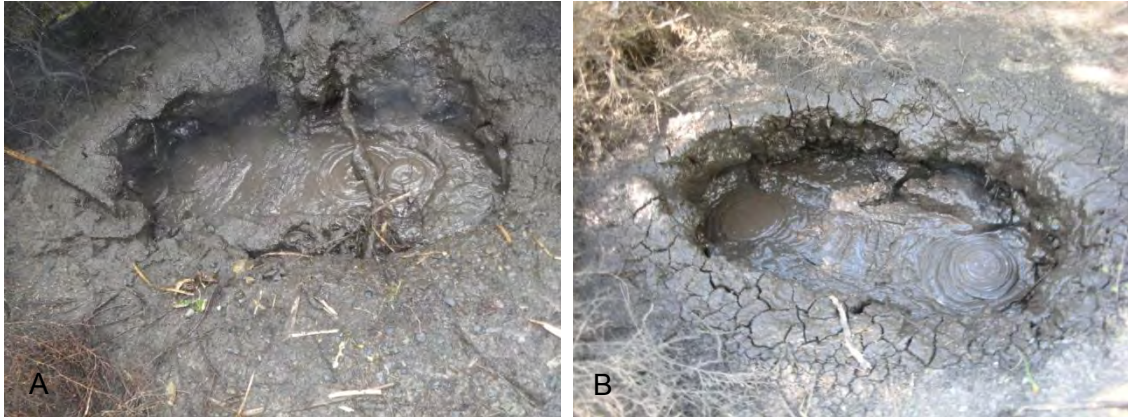


Figure 64: Mud Pool 1 at Tokaanu in October 2011 (A) and January 2012 (B)

- Mud Pool 2 & 3, 2 is the western one closest to the fence.

Table 53: Data from Mud Pools 2 & 3 at Tokaanu

Date	Pool	T(°C)	Liq discharge (l/s)	Diameter (m)	Ebullition	Colour
20 Jan 2012	2	90.3	0	0.5m	Bubbling at base	Dark brown mud
20 Jan 2012	3	90.5	0	0.3m	Bubbling at base, steaming	Dark brown mud

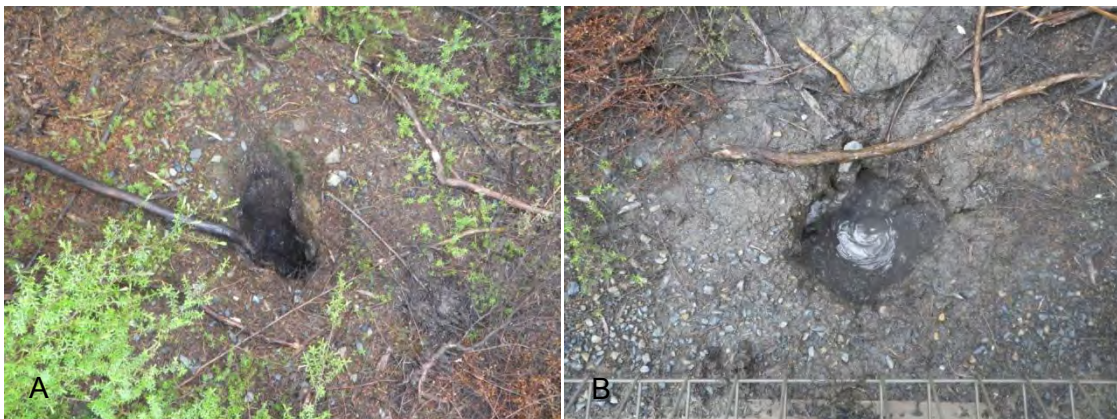


Figure 65: Mud Pool 2 (A) and 3 (B) at Tokaanu

- Mud Pool 4, North and South. In October 2011, there were cracked sides around the North Pool. The North pool had liquid mud with one large bubble constantly coming up in the centre. Steam could be seen in the South pool, with audible bubbling. The side was too deep to see bubbles.

Table 54: Data from Mud Pool 4 at Tokaanu

Date	Pool	T(°C)	Liq discharge (l/s)	Diameter (m)	Ebullition	Colour
20 Jan 2012	North	91.5	0	1m	Bubbling at base, weak steam	Dark brown mud
20 Jan 2012	South	92.3	0	0.5m	Bubbling at base, weak steam	Dark brown mud



Figure 66: Mud Pool 4 at Tokaanu in October 2011 (A) and January 2012 (B)

- Paurini Pool
E1839330 N5683049

Table 55: Data from Paurini Pool at Tokaanu

Date	T(°C)	pH	Flow (l/s)	Depth to water	Ebullition	Colour
28 Oct 2011	63.1	7	nd	0.8m below boardwalk	Very minor, beyond tree	Clear, slightly turbid, green
20 Jan 2012	59.7	7	nd	1m below boardwalk	Effervescing, gas discharge, some steam	Murky green



Figure 67: Paurini Pool at Tokaanu in October 2011 (A) and January 2012 (B)

- Teretere Pool
E1839358 N5683122

In October visibility in the pool was about 50cm.

Table 56: Data from Teretere Pool at Tokaanu

Date	T(°C)	pH	Flow (l/s)	Depth to water	Ebullition	Colour
28 Oct 2011	24.4	5	nd	10cm below track	Calm	Turbid brown
20 Jan 2012	25.4	5	nd	-	Calm	Black



Figure 68: Teretere Pool at Tokaanu

- Hydrothermal Eruption Crater Pool
E1839318 N5683119

In October 2011, visibility was about 40cm. Measurements were not taken in January 2012.

Table 57: Data from Hydrothermal Eruption Crater Pool at Tokaanu

Date	T(°C)	pH	Flow (l/s)	Depth to water	Ebullition	Colour
28 Oct 2011	30.5	6	nd	10cm below ground	Calm	Brown, clear

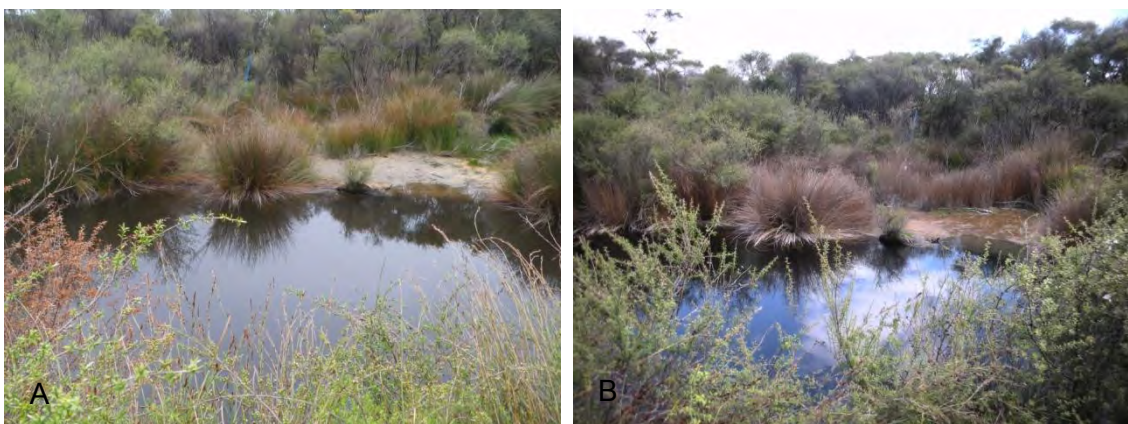


Figure 69: Hydrothermal Eruption Crater Pool at Tokaanu in October 2011 (A) and January 2012 (B)

- Vent by walkway

In October the vent was completely flooded and there was no visibility. In January, the vent was covered in an oily residue, so the colour could not be seen.

Table 58: Data from Vent by walkway at Tokaanu

Date	T(°C)	pH	Ebullition	Colour
28 Oct 2011	22.9	nd	No activity	Murky brown
20 Jan 2012	28.7	6	Occasional bubbles	-

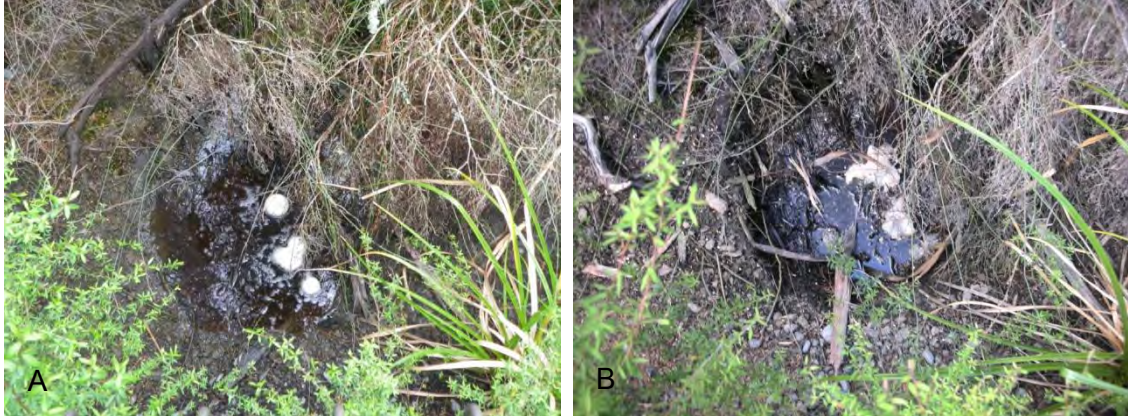


Figure 70: Vent by walkway at Tokaanu in October 2011 (A) and January 2012 (B)

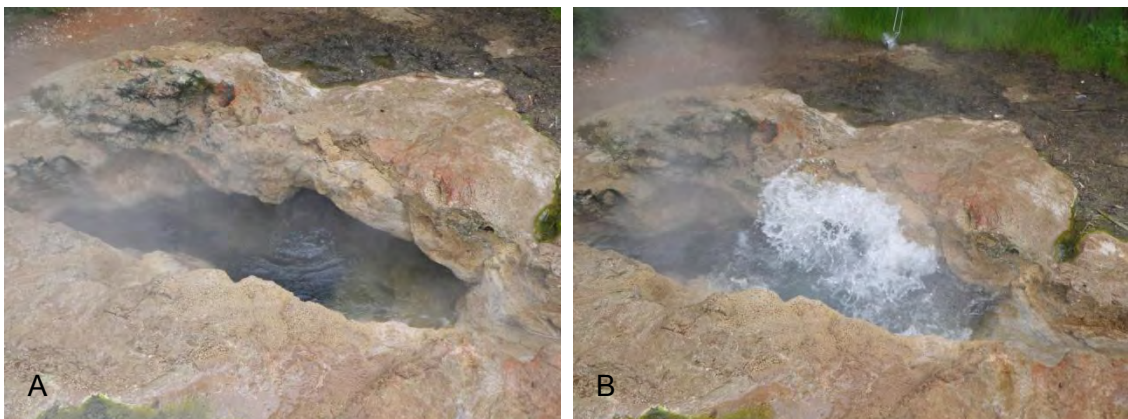
10.2 Cooking area

- Taumatapuhipuhi
Located number 72.2984

The artificial outflow is now approximately 0.5m deep from the highest point of the sinter terrace downstream, 1.5m from the pool. In October 2011, Taumatapuhipuhi discharged from the mid vent for approximately 30 seconds to a height of about 0.5m. The same vent boiled again 5 minutes later for approximately 15 seconds, to a height of about 0.5m. In January 2012, Taumatapuhipuhi discharged from the mid vent for approximately 10 seconds to a height of about 1.0m. Six minutes later the same vent discharged again for approximately 12 seconds.

Table 59: Data from Taumatapuhipuhi at Tokaanu

Date	T(°C)	pH	Height (m)	Eruption interval	Eruption duration	Colour
28 Oct 2011	98.3	7	0.5	5 min	30s and 15s	Clear
20 Jan 2012	96.2	7	1.0	6 min	10s and 12s	Clear



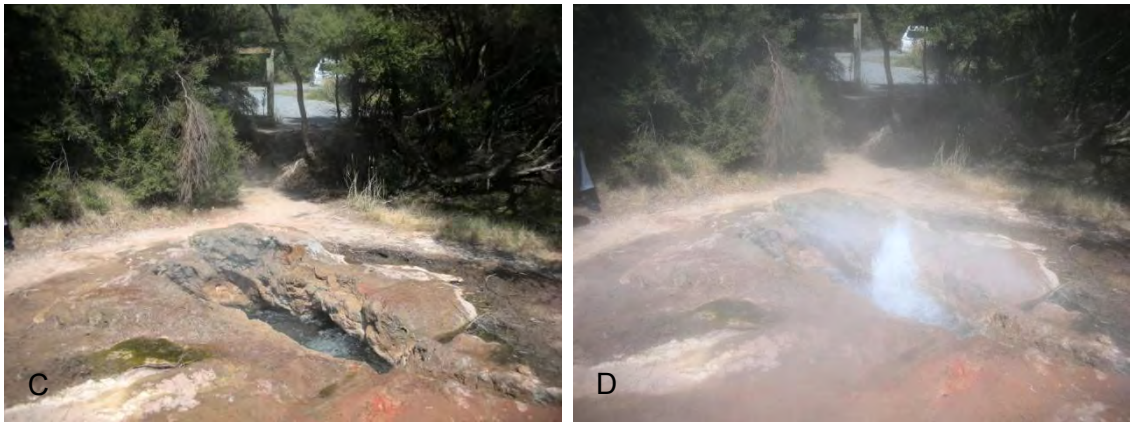


Figure 71: Taumatapuhipuhi at Tokaanu in October 2011 (A & B) and January 2012 (C & D)

- Hot vents at entry to cooking area

October 2011:

Vent 1 is boiling, temperature 94.2°C. Vent 2 is flooded in rut in track. Vent 3 is a cold hole in the ground. Number one is the only one still going, 2 and 3 are now part of the path and are cold. There is a boxed cooking pot NE of the vents beside the path. It appears that a tyre has been burnt over it. Sound of boiling in the bottom, steam coming out.

January 2012:

Vent 1 doesn't have much water, but is discharging vigorously at a temperature of 95.6°C. Vent 2 is 31.8°C. It is drowned in vehicle tracks, but is bubbling through the water. Vent 3 is 68.8°C, with a small amount of water coming through. While we were at the site, a tour guide was talking about the boxed vent which appears to have a tyre burnt over it. Apparently it was vandalised, with someone pouring kerosene down the vent.



Figure 72: Vents 1 (A) and 2 (B) at Tokaanu in October 2011 and Vents 1 (C) and 2(D) in January 2012



Figure 73: Boxed cooking pot at Tokaanu

- Main cooking area

October 2011:

- Feature no.5 is steaming at a temperature of 56°C.
- Feature no.6 is a boiling mud pool, temperature is 97.9°C. Water level is 0.5m below overflow
- Feature no.7 is in use
- Feature no.8 is a small pool of boiling muddy water at a temperature of 88.5°C.
- Feature no.9 has boiling water discharging from it and cannot be used. It has a temperature of 99.0°C.
- Feature no.10 is a square hole that has been dug to the left of 8 and 9. It has boiling muddy water with a temperature of 86.2°C. It has two small mud pots beside it, one with a loud boiling noise.

January 2012:

- Feature no.5 has audible gas discharge at a temperature of 73.8°C.
- Feature no.6 is a boiling mud pool, temperature is 93.8°C. Water level is 0.5m below overflow
- Feature no.7 is boiling vigorously at 99°C. The water is clear.
- Feature no.8 has weak steam, and has a temperature of 94.4°C. There is no water.



Figure 74: Cooking Area Features 5 (A), 6 (B), 7 (C) and 8 (D) at Tokaanu

11 Waikite

11.1 Waikite Swimming Pool area

- Manaroa Pool
E1888904 N5752722; Located number 72.4227

The main area of upwelling is on the far side of the pool. It surges every few minutes to a height of 0.5 - 1.0m. There are also several areas of effervescence. The sinter is brown. There is a lot of steam, making it difficult to get a clear photograph of the pool.

Table 60: Data from Manaroa Pool at Waikite

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
27 Oct 2011	97	9	40-50	overflowing	0.5m-1.0m upwelling. Effervescing in several areas.	Clear, deep blue
19 Jan 2012	96.7	9	40-50	overflowing	2 large areas of upwelling, up to 0.5m when surging.	Clear, deep blue

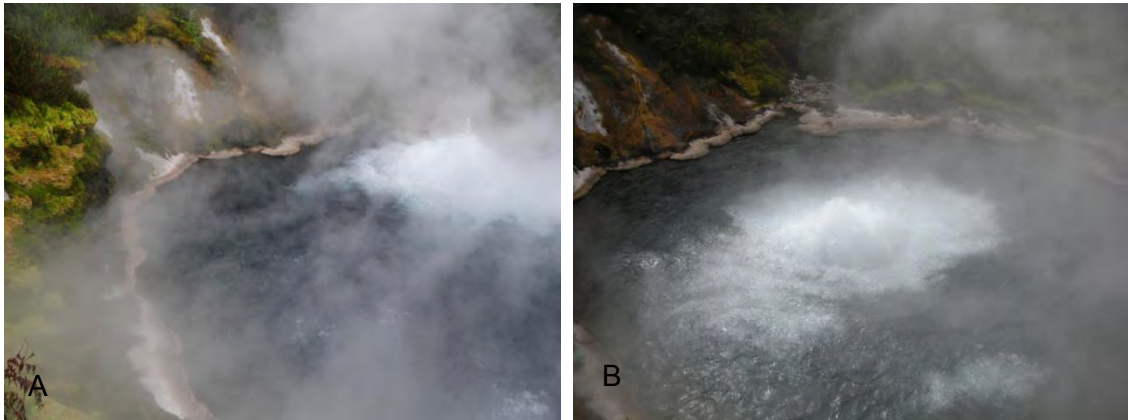


Figure 75: Manaroa Pool at Waikite in October 2011 (A) and January 2012 (B)

1. Hot Pool Supply Gully

- Upper Supply Spring
E1888866 N5752705; Located number 72.4227

Table 61: Data from Upper Supply Spring at Waikite

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
27 Oct 2011	95.6	9	pipied	0.3m below ground level	Vigorous discharge, boiling.	Clear
19 Jan 2012	94.8	7	pipied	0.3m below ground level	Vigorous discharge, boiling	Clear



Figure 76: Upper Supply Spring at Waikite in October 2011 (A) and January 2012 (B)

- Lower Supply Spring
Located number 72.4228

There are two areas of discharge associated with this spring, which flow into the same pool.

Table 62: Data from Lower Supply Spring at Waikite

Date	Spring	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
27 Oct 2011	Left	96.6	9	pipied	Overflowing	Vigorous discharge, boiling	Clear
19 Jan 2012	Left	95.5	7	pipied	Overflowing	Vigorous discharge, boiling	Clear
27 Oct 2011	Right	96.7	9	pipied	Overflowing	Vigorous discharge, boiling	Clear
19 Jan 2012	Right	96.7	7	pipied	Overflowing	Vigorous discharge, boiling	Clear



Figure 77: Lower Supply Spring at Waikite

- Pool adjacent to Lower Supply Spring

Table 63: Data from Pool adjacent to Lower Supply Spring at Waikite

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
27 Oct 2011	82	9	0.5	Overflowing	Continuous streams of small bubbles	Clear, grey
19 Jan 2012	76.9	9	1	Overflowing	Upwelling, small bubbles	Clear, grey



Figure 78: Pool adjacent to Lower Supply Spring at Waikite in October 2011 (A) and January 2012 (B)

11.2 DOC Reserve on Landcorp Farm

- Scalding Spring

This spring is fenced off. It appears to be a deep pool, with a shelf of sinter extending about 1m from the edge of the pool before it drops off. The sinter shelf is a few centimetres under water. The pool flows on to a sinter terrace which leads into the Otamakokore Stream; the temperature in the stream was measured at 38.9°C in October 2011.

Table 64: Data from Scalding Spring at Waikite

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
27 Oct 2011	94.9	9	1	Overflowing	Continuous upwelling next to the outflow	Clear, grey
19 Jan 2012	89.6	9	1	Overflowing	Calm	Clear, grey



Figure 79: Scalding Spring at Waikite in October 2011 (A) and January 2012 (B)

- Waikite Scarp and Spring
Located number 72.4393

The spring discharges into a small stream which flows onto the sinter terraces. There is new sinter both in the channel and on the margins of the stream. The terrace that the stream flows onto appears to have green and yellow algae growing on it.

Table 65: Data from Spring at Waikite Scarp

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
27 Oct 2011	94	9	0.5	Overflowing	Calm, steam	Clear, grey
19 Jan 2012	89.6	9	0.5	Overflowing	Calm, steam	Clear



Figure 80: Spring at Waikite Scarp



Figure 81: The stream from the hot spring (A), and the area where it discharges onto the terraces (B), (C) and (D) at Waikite Scarp

12 Waiotapu

12.1 Tourist Walk

- Weather Pool
E1894318 N5749245

The temperature in January was taken using an IR gun from the path, which is some distance from the pool.

Table 66: Data from Weather Pool at Waiotapu

Date	T(°C)	Water level	Ebullition	Colour
27 Oct 2011	nd	nd	Calm	Pale turquoise
19 Jan 2012	56.7	nd	Calm	Pale, murky green-blue

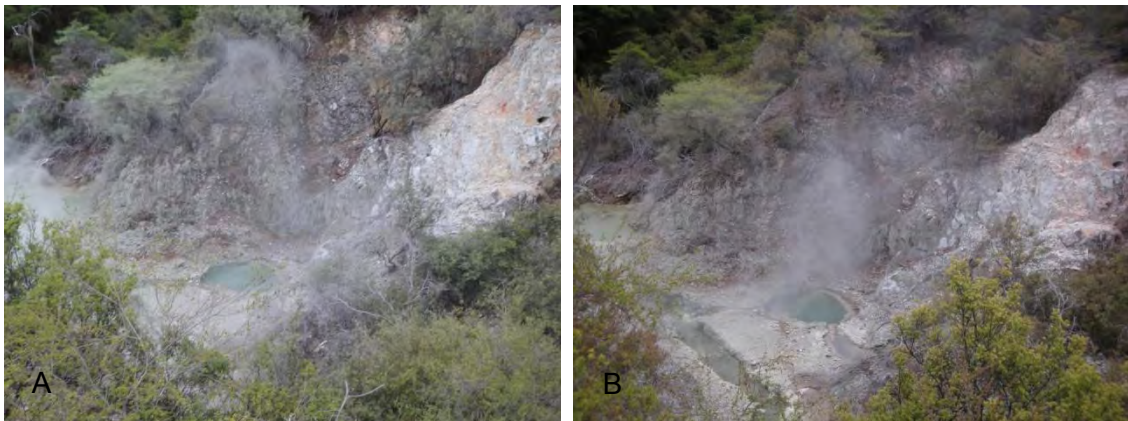


Figure 82: Weather Pool at Waiotapu in October 2011 (A) and January 2012 (B)

- Pool north of Jean Batten Geyser

Table 67: Data from Pool north of Jean Batten Geyser at Waiotapu

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
27 Oct 2011	22.7	7	-	Ground level	Calm	Clear
19 Jan 2012	27.6	5	seep	Overflowing	Calm	Clear



Figure 83: Pool north of Jean Batten Geyser at Waiotapu in October 2011 (A) and January 2012 (B)

- Jean Batten Geysir

Table 68: Data from Jean Batten Geysir at Waitotapu

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
27 Oct 2011	nd	nd	-	No visible water	Calm, steaming	-
19 Jan 2012	nd	nd	-	No visible water	Calm, steaming	-



Figure 84: Jean Batten Geysir at Waitotapu in October 2011 (A) and January 2012 (B)

- Sinter Terraces



Figure 85: Sinter Terraces at Artists Palette lookout at Waitotapu

- Sinter Terraces – Yellow coloured vent

Table 69: Data from Sinter Terraces – Yellow coloured vent at Waitapu

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
27 Oct 2011	nd	nd	-	Submerged	Calm	Dull blue/yellow
19 Jan 2012	nd	nd	-	submerged	Calm	Light yellow/green

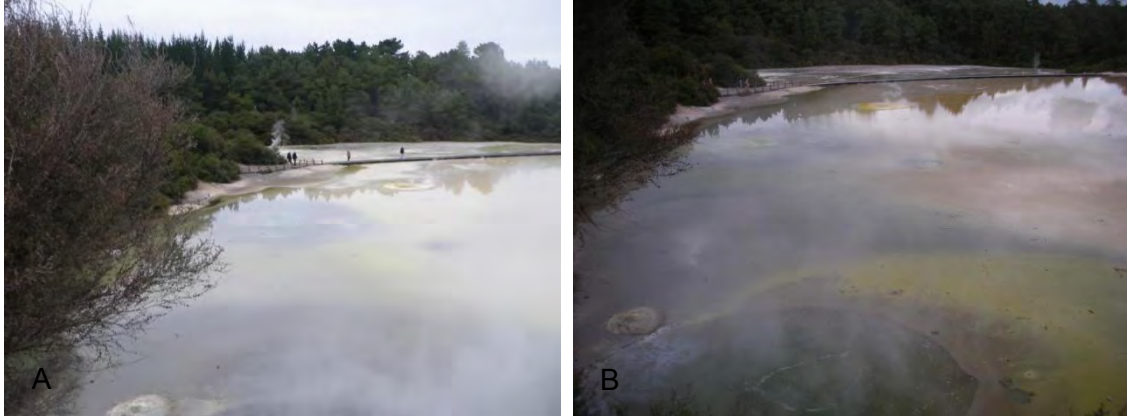


Figure 86: Sinter Terraces – Yellow coloured vent at Waitapu in October 2011 (A) and January 2012 (B)

- Sinter Terraces – Foreground Pool

The temperature in January was taken with an IR from the viewing platform, which is some distance away, so it may not be accurate.

Table 70: Data from Sinter Terraces – Foreground Pool at Waitapu

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
27 Oct 2011	nd	nd	-	Submerged	Bubbling	Turbid, grey
19 Jan 2012	30.3	nd	-	Submerged	Bubbling	Murky green

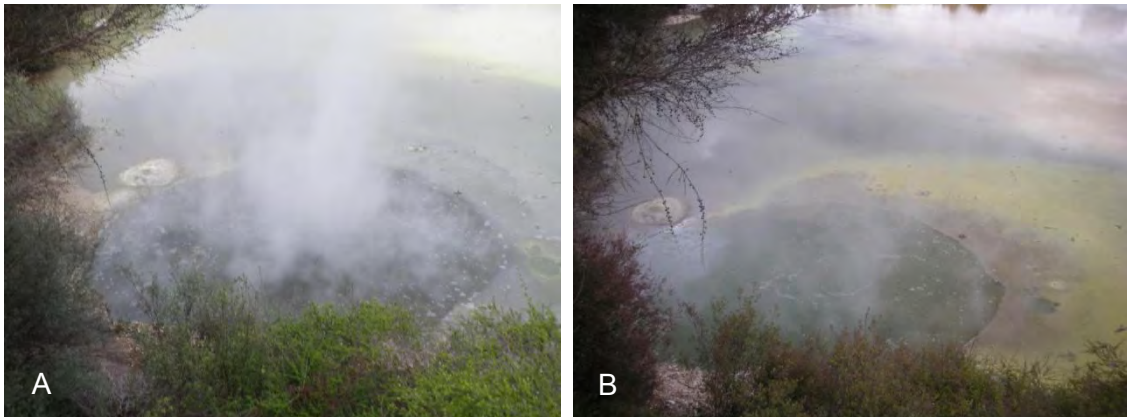


Figure 87: Sinter Terraces – Foreground Pool at Waitapu in October 2011 (A) and January 2012 (B)

- Waiotapu Geyser
E1894389 N5748720; Located number 72.3007

Table 71: Data from Waiotapu Geyser

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
27 Oct 2011	85.2	6.5	-	3cm below overflow	Calm, steaming	Clear
19 Jan 2012	75.1	7	-	1cm below overflow	Calm, some steam	Clear, dark grey/brown



Figure 88: Waiotapu Geyser

- Oyster Pool
E1894414 N5748668; Located number 72.4225

Table 72: Data from Oyster Pool at Waiotapu

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
27 Oct 2011	64.8	6	1	Overflowing	Minor bubbling in centre	Cloudy Light blue-green
19 Jan 2012	64.4	5	0.5	Overflowing	Moderately vigorous gas discharge	Cloudy pale green

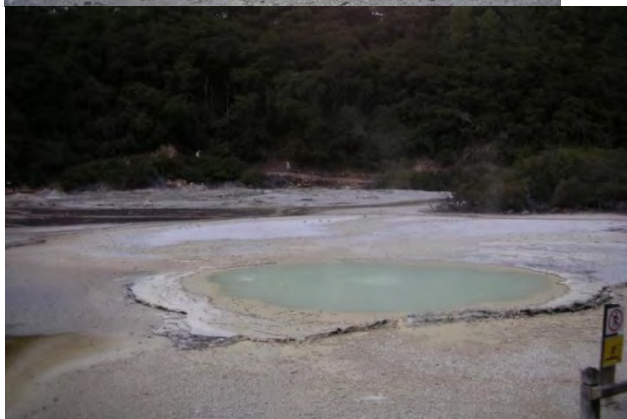


Figure 89: Oyster Pool at Waiotapu in October 2011 (A) and January 2012 (B)

- Lake Ngakoro
Located number 72.4226

Table 73: Data from Lake Ngakoro at Waitapu

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
27 Oct 2011	nd	nd	Inflow 20l/s	nd	Calm	Mid olive green
19 Jan 2012	26.6					

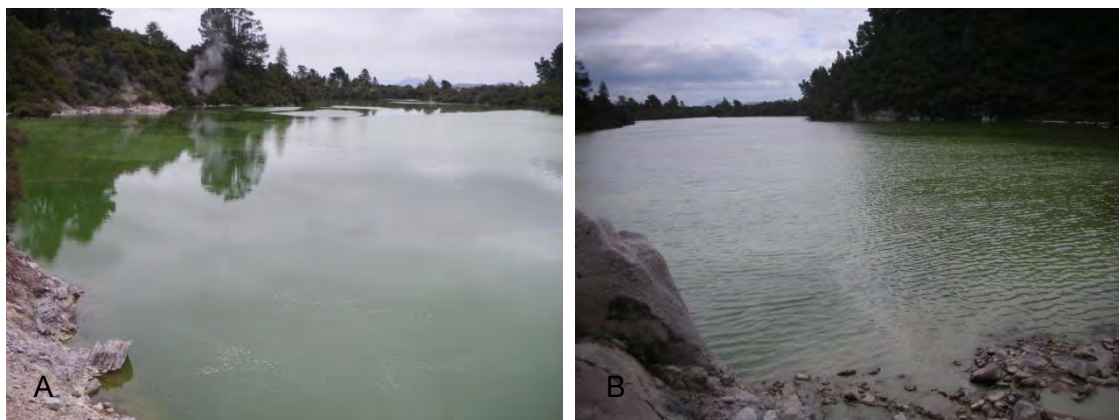


Figure 90: Lake Ngakoro at Waitapu in October 2011 (A) and January 2012 (B)

- Champagne Pool
E1894414 N5748950

Table 74: Data from Champagne Pool at Waitapu

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
27 Oct 2011	75	7	-	nd	Effervescing	Clear green
19 Jan 2012	72.9	7	-	20cm below rim	Effervescing	Murky green

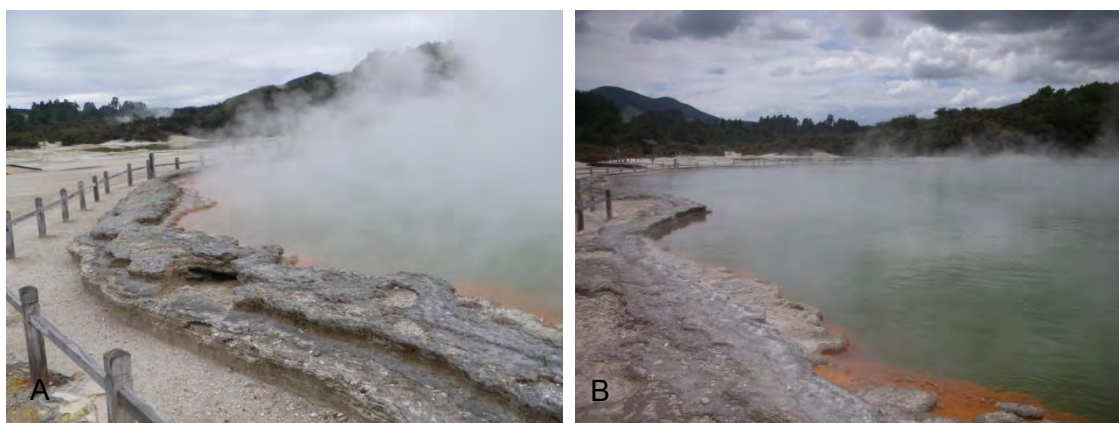


Figure 91: Champagne Pool at Waitapu in October 2011 (A) and January 2012 (B)

- Devil's Bath

Table 75: Data from Devil's Bath at Waiotapu

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
27 Oct 2011	nd	nd	-	40cm below high water mark	Calm	Bright green
19 Jan 2012	25.9	nd	-	30cm below high water mark	Some bubbling in centre	Bright, murky green

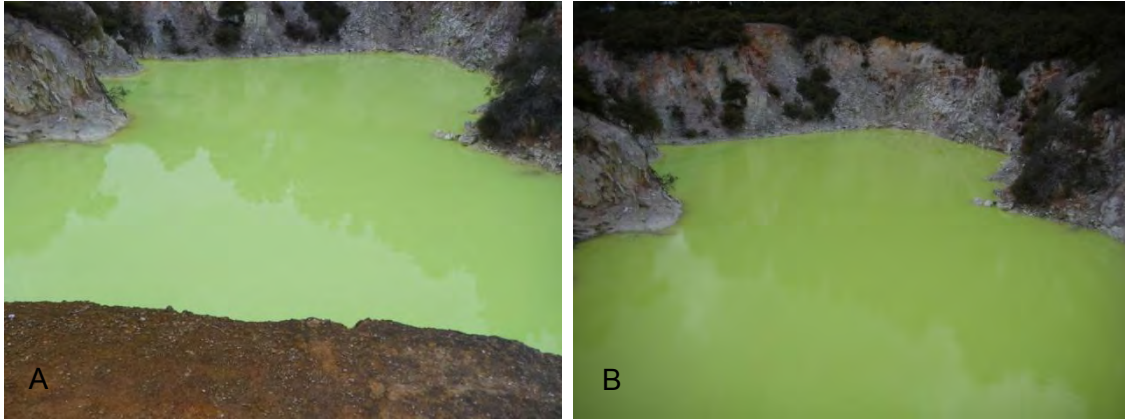


Figure 92: Devil's Bath at Waiotapu in October 2011 (A) and January 2012 (B)

12.2 Knox Geyser area

- Hidden Pool
E1894833 N5749981

There were no swimmers in the pool on 27th October at 18:05. On the 19th January 2012, there was one bather in the pool at 12:00.

Table 76: Data from Hidden Pool at Knox Geyser area, Waiotapu

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
27 Oct 2011	38.6	3	nd	Overflowing	Calm	Cloudy grey/brown
19 Jan 2012	40.1	3	10	Overflowing	Small bubbles, gas discharge	Cloudy, brown

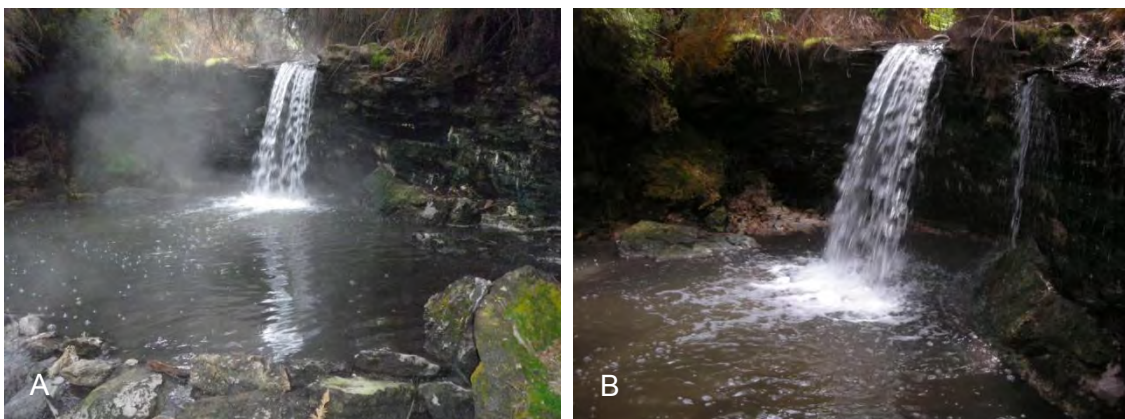


Figure 93: Hidden Pool at Knox Geyser area, Waiotapu in October 2011 (A) and January 2012 (B)

- Venus Pool in creek on Lady Knox Road
E1895377 N5749891

This is a warm stream on Lady Knox Road.



Figure 94: Venus Pool in January 2012, at Waiotapu

12.3 Waiotapu Loop Road Pools

- E1893976 N5749319

Along Waiotapu Loop Road is a bridge, underneath which is a tributary of the Waiotapu Stream. There are two pools, one either side of the road. In October 2011, there were three swimmers in one pool and two in the other at 17:39.



Figure 95: Pool on Waiotapu Loop Road

12.4 Kerosene Creek Area

- Kerosene Creek Pool
E1896006 N5751572

There were 10 cars in the car park, and 4 bathers in the pool. There were 9 bathers in the larger pool downstream, and on our way back there were 5 people walking down from the car park.

Table 77: Data from Kerosene Creek Pool at Waiotapu

Date	T(°C)	pH	Flow (l/s)	Water level	Ebullition	Colour
19 Jan 2012	39.4	3	150	Overflowing	-	Slightly cloudy

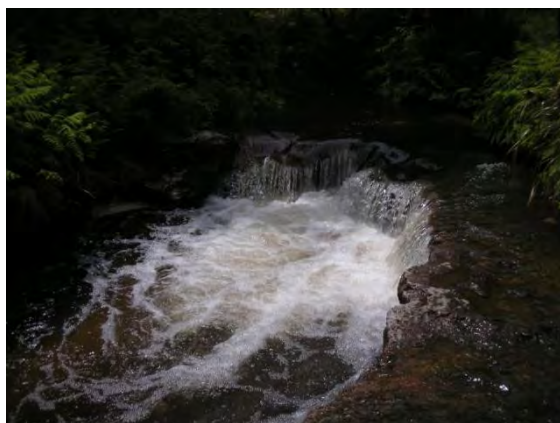


Figure 96: Kerosene Creek Pool at Waiotapu

Appendix 1

The appendix for this report is an Excel spreadsheet, Waikato Regional Council document number 2142693. This may be obtained upon request from the Waikato Regional Council.