



NGĀ WAI ARIKI O ROTORUA: HE KOHIKOHINGA

HAU KĀINGA PERSPECTIVES ON
THE HEALTH AND WELLBEING OF
GEOTHERMAL TAONGA WITHIN ROTORUA

MIHIMIHI

Ka whanake i raro i ōna Taranga

Tutuki te rangi

Eke Eke Eke Tangaroa

Eke panuku

Hui e

Taiki e

Ngā mate o ngā whanaunga i tēnei whenua

Haere, haere, haere atu rā

Haere ki ō kuia, ki ō koroua

Nō reira e ngā mate – Haere atu rā

Āpiti hono tātai hono

Te hunga mate ki te hunga mate

Āpiti hono tātai hono

Te hunga ora ki te hunga ora

Tēnā koutou katoa

Tēnā koutou i ō koutou whakaaro tautoko

mō tēnei kaupapa:

Ngā Wai Ariki o Rotorua: He Kohikohinga

i ahu mai i tō mātau rōpū Te Ahi Kaa Roa

Kei te mihi atu ki a koutou mō tā awahi, tautoko hoki i tēnei kaupapa.

Nō reira

Tēnā koutou katoa



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GLOSSARY

Ahi Kā	Enduring home fires or burning home fires of occupation.
Ahi Tipua	A term to describe geothermal or volcanic activity. It originates from the journey of Te Hoata and Te Pupu from Hawaiki to Tongariro.
Hau kāinga	Home, local people of a marae, home people. Also known as Hunga kāinga.
Kāinga	A home, or village.
Mātauranga	Directly translates to Māori knowledge. This term not only refers to the knowledge that Māori have, but encompasses the Māori way of knowing and the connectedness that knowledge has with the environment out of which it was derived.
Taonga	Treasure, anything prized - applied to anything considered to be of value including socially or culturally valuable objects, resources, phenomenon, ideas and techniques.
Taonga tuku iho	Heirloom, treasure handed down; cultural property, heritage.
Waiariki	Geothermal. Directly translates to chiefly waters or water from the gods. A term to also describe a warm pool that doesn't boil.
Ngāwhā	A hot boiling pool, including hot springs and mud holes.
Puia	Geyser - a boiling spring that boils up intermittently and violently.

EXECUTIVE SUMMARY

TE AHI KAA ROA

Te Ahi Kaa Roa are a collective of representatives from hapū and iwi who have maintained continuous occupation of Ōhinemutu, Whakarewarewa, Tārewa Pounamu and Ngāpuna villages in Rotorua since pre-European times.

Ahi kā refers to the 'burning fires of occupation', and the whānau who reside in these villages have a long and unique relationship with the geothermal resources, features and activity around them. Their mātauranga, which includes intergenerational knowledge, is built upon sensory-based tohu or indicators.

Te Ahi Kaa Roa was established as one way to ensure a tangata whenua lens, or perspective, regarding the management of the Rotorua Geothermal System and to afford hau kāinga a clear voice in the review of the Rotorua Geothermal Regional Plan.

PURPOSE

The purpose of this report is to answer the following questions, from a hau kāinga perspective:

1. **How healthy are our geothermal taonga?**
2. **How much has the use of our geothermal taonga changed and why?**

ARTICULATING GEOTHERMAL HEALTH

While there are similarities in what is measured in cultural and mainstream terms (e.g. behaviour of geothermal features), the Māori worldview highlights that the environment and all it sustains (including people) is interconnected and cannot be looked at in isolation.

For this reason, describing geothermal health, from a hau kāinga perspective is wider than the 'physical health' of the resource as it includes the wellbeing of interconnected ecosystems including people.

There has been a significant change in geothermal use and management over time by tangata whenua due to the intergenerational impacts of colonisation and resultant loss of control over their natural resources. Subsequent land use and development within the city, and the bore closure programme in the 1980s have occurred without consent or input of hau kāinga.

CHALLENGES AND FRUSTRATIONS

The process of collating cultural views, perspectives and observations has enabled hau kāinga to articulate their views on the state of the geothermal resource in Rotorua. It has also highlighted the:

- sheer depth of mamae (hurt) and loss felt by hau kāinga due to the impacts of historic legislation; city development; land use as well as geothermal management and use.
- challenge of articulating qualitative observations of varying timeframes (e.g. 10, 30, 50+ years), depending on the site, area or information source.
- frustration of hau kāinga in needing to explain and justify their observations and position to Council when "it has been told over and again".

Te Ahi Kaa Roa hope the knowledge and mātauranga shared as part of the current work with Council will help to inform future management and monitoring of the system.





SECTION ONE

INTRODUCTION

This technical report, prepared on behalf of Te Ahi Kaa Roa, provides a collation of views, perspectives and observations of hau kāinga about the current health and wellbeing of the Rotorua Geothermal System (page 8). It was commissioned by the Bay of Plenty Regional Council (Council).

PURPOSE OF THIS REPORT

The purpose of this report is to answer the following questions, from a hau kāinga perspective:

- 1. How healthy are our geothermal taonga?**
- 2. How much has the use of our geothermal taonga changed and why?**

To be able to do so, this report also:

- Articulates the innate connection of hau kāinga with geothermal taonga.
- Describes the observed changes over times in relation to geothermal use as well as the behaviour of key geothermal features.
- Highlights the long-term implications of past and current geothermal allocation and use on the health of geothermal taonga and hau kāinga.

This technical report is a step towards addressing the following:

“we don’t currently use mātauranga Māori to help us understand how the system was created, its characteristics and the changes that we observe. Nor do we use it to manage the system, and we have no cultural monitoring programmes.

However, mātauranga associated with ngāwhā of Te Arawa has historical significance, is site specific and for Māori informs how we should behave.”

Bay of Plenty Regional Council, 2019

This report helps to articulate hau kāinga values, use and priorities associated with geothermal taonga. In the context of this report, geothermal taonga includes, but is not limited to, puia (geysers) and ngāwhā (hot pools).

TE AHI KAA ROA

Ahi kā refers to the ‘burning fires of occupation’, and hau kāinga (Māori communities that have continuously occupied an area) of Rotorua’s geothermal areas have lived with, and amongst, geothermal activity for hundreds of years. It is evident that initial settlements were selected due to the presence of geothermal activity, which enabled the use of:

- Warm pools (waiariki) for bathing, relaxation, spiritual wellbeing and treating ailments such as rheumatism, eczema.
- Boiling springs (ngāwhā) for cooking and to prepare flax for weaving.
- Hot ground for cooking and heating.
- Mud, from some pools, for medicinal purposes.
- Kōkōwai (red ochre) from hydro-thermally altered ground.

Council has legal requirements and obligations to Māori under the Treaty of Waitangi, Resource Management Act 1991 and Local Government Act 2002. Because of their intergenerational knowledge and experience, Council initiated the establishment of Te Ahi Kaa Roa. It was one way to enable and ensure a tangata whenua lens or perspective regarding the management of the Rotorua Geothermal System and that hau kāinga are afforded a clear voice in the review of the Rotorua Geothermal Regional Plan.

The group, who have been meeting regularly since January 2019, were involved in the development of an Issues and Options report in August 2019 for the Rotorua Geothermal System.

It is noted that establishing this group does not absolve Council of the obligation to consult with hapū, iwi and post-settlement governance entities in relation to the review of the Rotorua Geothermal Regional Plan.

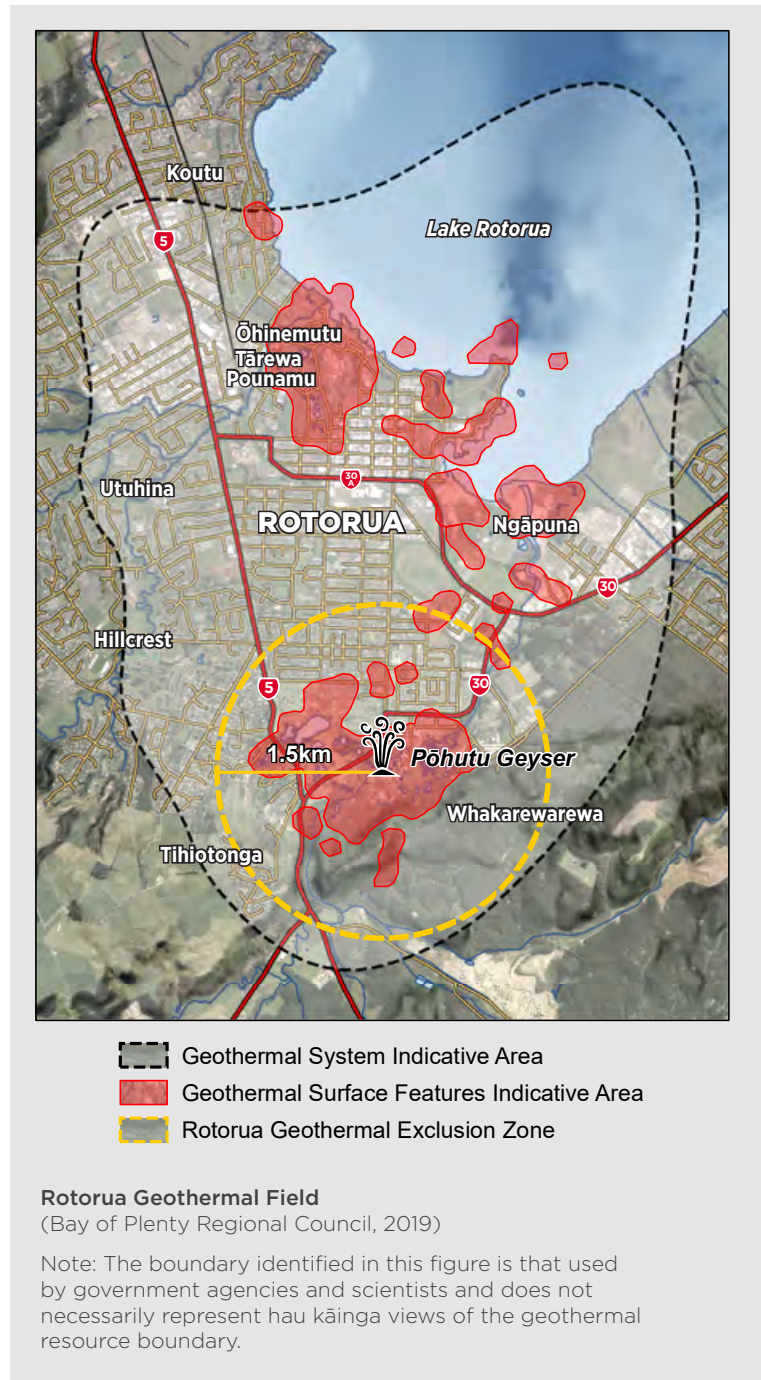
The work of the group will continue beyond the preparation of this report.

SCOPE AND LIMITATIONS OF THIS REPORT

This report relates to four specific areas within the Rotorua Geothermal Field, namely Whakarewarewa, Ngāpuna, Ōhinemutu and Tārewa Pounamu (refer map right).

It is essential to point out that this report:

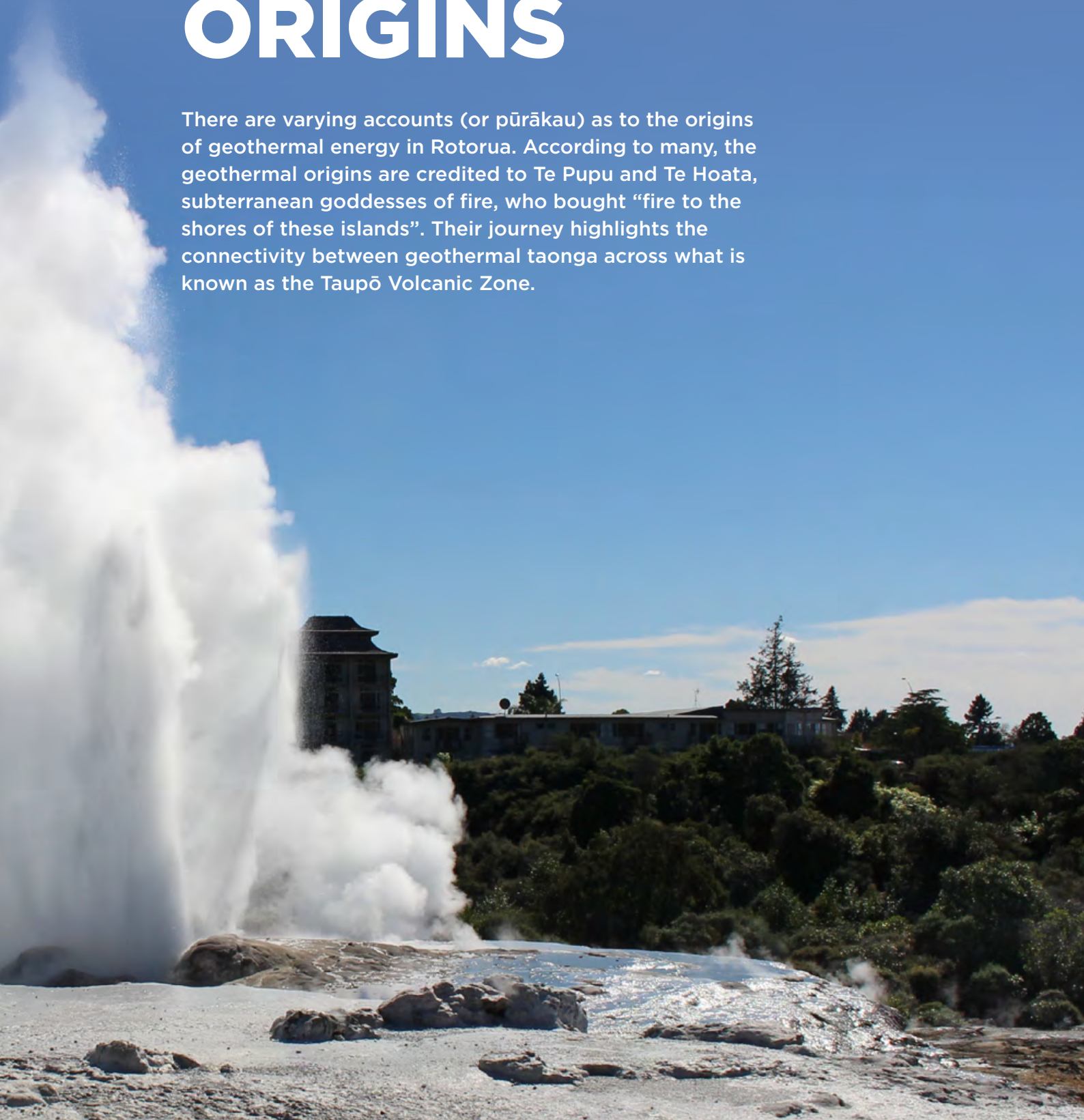
- Only includes the perspectives and observations shared at meetings by Te Ahi Kaa Roa members; at Council engagement hui; and found within published documents / reports.
- Uses western science defined boundaries and maps to identify geothermal areas, noting that these do not necessarily align with the tangata whenua world view of the geothermal resource.
- Does not cover all geothermal areas in Rotorua e.g. Marguerita Street area.
- Does not speak on behalf all hau kāinga, hapū and iwi. The views and experiences of each will vary.
- Does not cover Treaty claims or settlements relating to geothermal resources.
- Refers to observations of varying timeframes (e.g. 10, 30, 50+ years), depending on the site or areas and information source.
- Does not alleviate any obligation by Council to involve hau kāinga in future processes e.g. regional plan change.



SECTION TWO

GEOHERMAL ORIGINS

There are varying accounts (or pūrākau) as to the origins of geothermal energy in Rotorua. According to many, the geothermal origins are credited to Te Pupu and Te Hoata, subterranean goddesses of fire, who bought “fire to the shores of these islands”. Their journey highlights the connectivity between geothermal taonga across what is known as the Taupō Volcanic Zone.



TE AHI TIPUA: THE JOURNEY OF TE PUPU AND TE HOATA

The late tōhunga whakairo (master carver) and historian Te Keepa Marsh describes the journey of Te Pupu and Te Hoata to save the life of Te Arawa tōhunga Ngātoroirangi. The abridged version of this account is as follows:

“When the Arawa canoe made landing at a beach near the outlet of the Tarawera River called Te Kopu a Kuku, Ngātoroirangi had disembarked and started on his journey inland to Taupō. Gazing upward, Ngātoroirangi longed to ascend the virgin peak.

Ngātoroirangi knew the great mana of the mountain, and the elements that surrounded him. Those beings were Hahunga (frost), Hukapapa (ice), Hukarere (snow), and Hautonga (cold south winds). His mission was to ensure the survival of his people and their food sources that were bought from a warm climatic homeland.

At this time on the peak of Tongariro, the cold pierced through Ngātoroirangi’s heart as he fell into the snow, looking upwards and facing towards Hawaiiki, he cried to his sisters Kuiwai and Haungaroa to send fire to warm him for death was near.

*“Kuiwai e! (Oh Kuiwai!)
Haungaroa e! (Oh Haungaroa!)
Ka riro au i te Tonga (I have been captured by the southern winds)
Tukuna mai te ahi! (Send me fire!)”*

On Kuiwai and Haungaroa, Te Keepa says “Hearing, feeling and sensing their brother’s (Ngātoroirangi) anguish, they ran from their village in Hawaiiki to the beach of Tataiwhenuakura and called on Te Pupu and Te Hoata, the subterranean goddesses of fire, to help and assist their brother in the land of Aotearoa.

Te Pupu and Te Hoata knowing that time was of the essence plunged into the waters of Kiwa, beneath the crust of the seabed, heating the ocean floor, at great speed made their way to Aotearoa.

Traveling over three thousand miles under the seabed, raising their heads, they burst through the surface at a place called “Whakaari”, White Island, the earth burst into flames as they emerged through the crust, leaving the great flaming fire, the volcano, Te Ahi Tupua.

Resting awhile from their journey, they ploughed once more into the earth’s crust, into the ocean floor and emerged at a place called “Moutohorā”, Whale Island, just off the east coast of Whakatāne, leaving waiwera (hot water).

They then travelled to Okakaru, near Mount Pūtauaki, then on to Rotomā, Rotoehu, Rotoiti, and resting for a short while at “Tikitere”, Hells Gate, then on to Rotorua. Here the sisters separated, one going to Mokoia, Ōhinemutu and to Kuirau. The other went to Waikawa, Ngāpuna, Tarawera and Rotomahana. Finding that their brother was not at any of these places they converged on Whakarewarewa, and rested on a hill called “Te Puke a Te Ruahine” in the thermal valley. Whilst regaining their strength, every breath inhaled and exhaled, they gradually formed the many pūia, geysers, ngāwhā, hot springs, waiparu, and mud pools which are exclusive to this region. Onwards the sisters journeyed, to Waiōtapu, Reporoa, Ōrākei Kōrako, Paeroa, Taupō and Tokaanu. Sensing their destination was near, they surged through the base of the mountain emerging through the peak of (Mt.) Tongariro, beneath his’ feet, saving Ngātoroirangi’s life - giving life to Ngātoroirangi’s frozen body, warming his blood and restoring him back to health.

(Mt.) Tongariro, received his name when Ngātoroirangi had told his sisters that he was being carried off by the southerly cold winds, “Ka riro au i te tonga”.

The name “waiariki” came to be because it had taken an Ariki like Ngātoroirangi to call for fire and heat to be sent.

That is why the people of that area called it “Waiariki” not waiwera (hot water).”

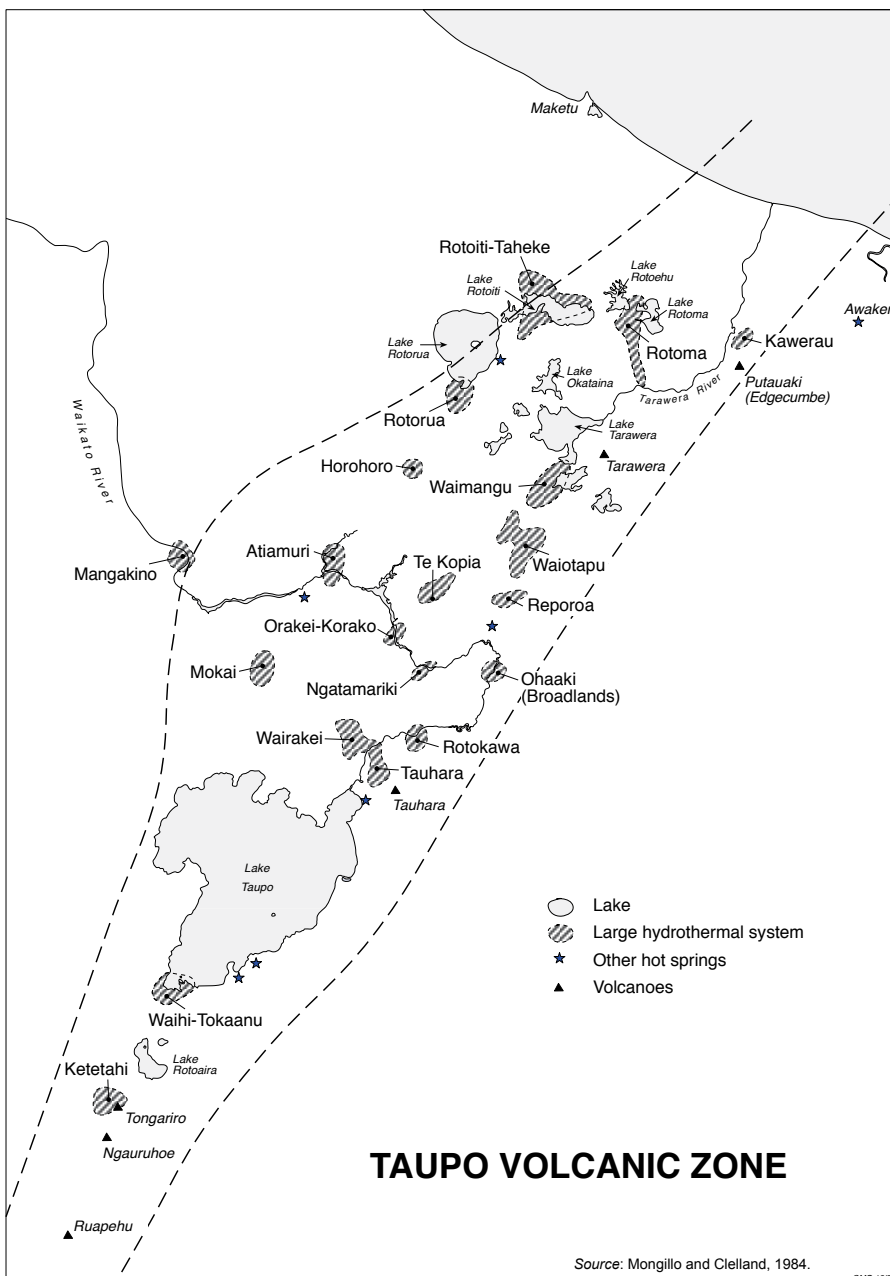
– abridged from Neilson, Bignall and Bradshaw (2010)

TRACING TE AHI TIPUA

Pūrākau (storytelling) is one of many methods of recording and transferring oral histories and knowledge about the natural environment and tangata whenua.

The diagram below shows the geothermal areas within the Taupō Volcanic Zone. It aligns with the locations visited by Te Pupu and Te Hoata and highlights what Māori have always known - that geothermal taonga, from Whakaari to Tongariro, are part of a single interconnected system.

Hau kāinga have always known when the health of geothermal taonga is diminishing or increasing based on its appearance and behaviour. This was evident on 9 December 2019 when Whakaari/White Island erupted. In the hours preceding the event, Ngāti Wāhiao whānau observed that ngāwhā at Whakarewarewa were more active than usual. This highlights the intimate knowledge of hau kāinga as they observe and make sense of their surrounding environment.





SECTION THREE

DESCRIBING THE HEALTH OF GEOTHERMAL TAONGA

It is impossible to describe the physical state of geothermal taonga without:

- providing an overview about Te Ao Māori and mātauranga in relation to geothermal taonga.
- articulating the strong linkage between geothermal health and the health and wellbeing of related ecosystems including people.
- identifying key tohu or indicators to articulate the health of geothermal taonga.
- acknowledging the dynamic and unpredictable nature of a geothermal environment.
- outlining the impacts of the following on the health and wellbeing of whānau living in a geothermal environment associated with the development of the city as well as the bore closure programme of the late '80s.

MĀORI WORLDVIEW

The Māori worldview is holistic and interconnected. Māori see themselves as part of the environment and vice versa. The connection of Māori to the environment is both physical and metaphysical and transcends time. It is intergenerational and informs and guides mātauranga.

Although mātauranga Māori directly translates to “Māori knowledge”, it has much broader and deeper meaning, encompassing a “Māori way of knowing” that is based on hundreds of years of observations and experience (Bay of Plenty Regional Council, 2019a). It is unique for each hau kāinga.

According to hau kāinga, the Rotorua Geothermal System is not just a resource, it is a taonga-tuku-iho and a source of pride and cultural heritage.

The use of geothermal taonga has always been for communal benefit, providing for people’s collective cultural, social and economic wellbeing.

There was particular knowledge and practices associated with geothermal taonga, based on Mātauranga Māori. For example, which pools provided rongoā; rules about use of the communal bathing pools, etc.

“Māori uses of geothermal surface features were ‘carefully regulated by a linked body of rules and concepts which need to be thought of as nothing less than Māori customary law of resource management”.

Boast, 1992

The geothermal taonga is used for bathing, home heating, healing, and cooking provides for the health and wellbeing of whānau, hapū and wider communities. It is part of everyday lives, an essential component of social connectivity and a means of sharing knowledge, it plays a critical role in maintaining connection between whānau and the social fabric and cohesion within the hapū:

Besides the warmth provided in the winter months, the baths also provided a sheltered place to relieve ailments, gather and talk or debate about community politics within the tribe, gossip about people and events, and share stories and traditions from bygone days.” Manley, 2019

“These activities built whanaungatanga amongst the people... represent the tikanga which were enjoyed and passed down between generations... we take our children to the land and pass on the stories and traditions of our ancestors... the wellbeing of these features of our land is of paramount concern...”

Hurunga Te Rangi Marae and Ngāpuna A 2nd Residue Trust, 2011

The ability to use steam boxes for cooking is important for manaakitanga (hosting and providing) for large gatherings. There are also environmental benefits and reduced economic costs that come with geothermally-heated steam boxes, pools, homes and marae.

Geothermal activity has been a major drawcard for tourists since the late 1800’s, particularly with the international appeal and marketing of Rotorua as one of the spa capitals of the world. It is therefore a major source of employment and income for Rotorua city.

The health and wellbeing of hau kāinga is directly linked to the health of geothermal taonga. The descendants of Ngātoroirangi have responsibilities, as hau kāinga and hunga tiaki, to ensure the ongoing use and maintenance of the mauri of geothermal taonga for future generations.

ARTICULATING GEOTHERMAL HEALTH

Geothermal health can be articulated using the Māori terms for health and wellbeing, namely waiora and hauora.

Both terms relate to the physical health of geothermal taonga (wai: water, which relates to water level, temperature and composition, and activity; hau: wind, which links with steam as well as aquifer pressure needed for geysers) as well as the health and wellbeing of people. The two are interconnected and cannot be looked at in isolation. This is because the health and wellbeing of tangata whenua is intrinsically linked with the mauri (lifeforce) of wai (water). The state of wellbeing of the hapū depended on the protection and maintenance of the mauri of the waiariki.

“Mauri is reciprocal – our mauri is filled up by the mauri of wai, and our ngāwhā and puia will also begin to heal when our connections and relationships are restored. When the giving and taking of mauri is not occurring, neither can heal. If hau kāinga are increasing and restoring their relationships with their ngāwhā and puia, even in small ways, then they are giving back in some way to the mauri of these geothermal features. Both aspects are connected and cannot be looked at in isolation.”

(L. Kereopa, personal communication, August 2020)

For this reason, a number of people-centric indicators are also explored in the report:

- **Home heating** – can we warm our houses like we used to?
- **Cooking and preparation** – can we cook like we used to?
- **Bathing** – can we bathe like we used to?
- **Marae use** – can we heat and cook at our marae like we used to?

Other indicators, which are not covered in detail in this report, include:

- **Cultural and spiritual use** – are we still able to practice our tikanga and kawa?
- **Health and wellbeing** – are we still able to heal and restore ourselves like our tūpuna were able to?

GEOTHERMAL TOHU (INDICATORS)

Mātauranga is living, interactive knowledge gained from being immersed within and connected to an environment.

Because hau kāinga live within their respective geothermal areas, they know and feel the natural rhythms of geothermal taonga. They use tohu, or indicators, to notice changes over time.

Many of the tohu relate to changes and variations in surface features as they could be observed easily.

The tohu for geothermal taonga are sensory-based and, depending on the area, include:

TOHU	EXAMPLES
Visual / sight	<ul style="list-style-type: none"> • Presence (or absence) of geothermal features, including springs and geysers. • Height / strength of a geyser. • Behaviour of ngāwhā e.g. Is it overflowing or not? Is it bubbling more than usual? • Presence (or absence) of specific vegetation e.g. Mānuka grows where the water is cooler. • Changes in water colour and clarity. • Changes in biota present in the water.
Feel / touch	<ul style="list-style-type: none"> • Water temperature e.g. Is it cooler than usual? • Water texture e.g. How it feels to touch. • Strength of ground shaking i.e. Associated with geysers
Aural / sound	Is the geyser or ngāwhā louder than usual?
Smell	Any changes in the smell?

It is important to note that bore development introduced a level of uncertainty and changed the behaviour of geothermal taonga. This impacted the ability of the hau kāinga to detect and respond to observed changes.

A DYNAMIC AND UNPREDICTABLE ENVIRONMENT

Living within a geothermal environment means accepting the dynamic and unpredictable nature of the resource. Types of activity includes, but is not limited to¹:

- The eruption of geysers at Te Pākira marae, Te Papaiōuru marae and Para te Hoata (Tūnohopū) marae.
- Hydrothermal eruptions and blowouts in the Kuirau Park area.
- Blowouts of sealed bores e.g. between Amohau Street and Eruera Street in August 2015.
- Appearance of a new fumarole or mudpool in a residential area near Whakarewarewa village in June 2019.

The hau kāinga had a heightened level of awareness of the fragility of the geothermal environment, within which they lived. For example, the risk of injury (or death) was an accepted part of the village way of life. Burn marks were common. There was a heightened sense of awareness for safety, particularly for tamariki (children) and manuhiri (visitors). High risk areas were taught to tamariki (children). Visitor safety was critical and connected to the mana of the hapū (i.e. ability to manaaki).

¹ NZ Herald (2003, 2012), Rotorua Daily Post (2015, 2019), Te Ao Māori News (2015)

IMPACTS OF HISTORIC USE AND DEVELOPMENT

The establishment and development of the city in addition to bore closure programme of the late 80's has had a significant and long-lasting impact on the people living at Whakarewarewa, Ōhinemutu, Ngāpuna and Tārewa Pounamu.

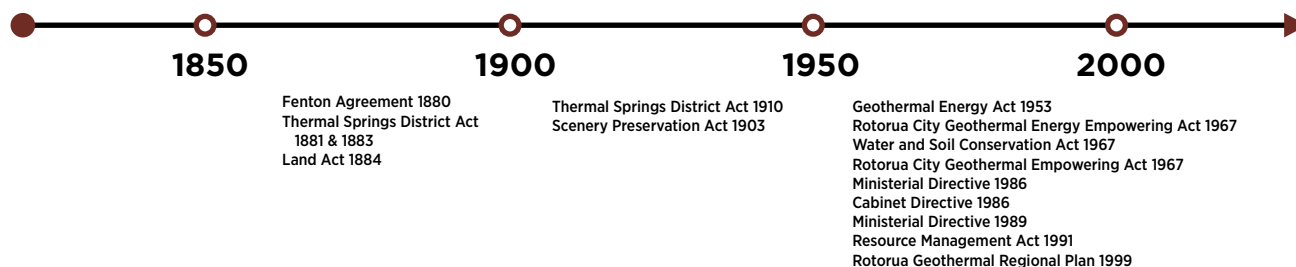
This report does not provide a full historical account but instead outlines key aspects to provide awareness and understanding as to the cause, scale, duration and depth of loss felt by hau kāinga.

DEVELOPMENT OF THE CITY

Geothermal taonga, and the relationship of hapū and iwi with those taonga, have been affected by the development of Rotorua City. This includes, but is not limited to:

- acquisition, alienation and/or individualisation of Māori land title; and subsequent conversion of land for commercial and industrial development.
- compulsory acquisition of Māori lands, comprising geothermal areas, for scenery preservation.
- reclamation or infilling of geothermal areas at Ōhinemutu and Ngāpuna.
- industrialisation of Ngāpuna causing the pollution and loss of geothermal springs and pools.
- excavation and/or diversion of ngāwhā and urban streams for land development and/or flood protection purposes.
- unconstrained access to the Rotorua Geothermal Field, leading to over extraction and loss of geothermal features and use of geothermal wells for home heating.

The timeline below outlines the key agreements, legislation, and directives of relevance to Rotorua City and the Rotorua Geothermal System.



Timeline of legislation, agreements or directives that have influenced geothermal management and use in Rotorua

Early legislation enabled the Crown to assume the right to utilise and regulate geothermal resources.

“In 1953, the Crown used the Geothermal Energy Act to negate the private property rights of Māori. This was done without consultation with Māori or their consent. In 1967, the Rotorua Geothermal Energy Empowering Act was passed and enabled the then County Council to make provisions for the control of the tapping and use of geothermal energy in the city of Rotorua.

This allowed the Council to have the sole power to allocate the use and utilisation of the geothermal resource. This in effect took the mana of Ngāti Whakaue away as the custodian and kaitiaki of the natural geothermal resource in the Rotorua area”.

Raana, 2005, as cited in Waitangi Tribunal, 2008

A number of Treaty claims remain unresolved in relation to this.

The intergenerational impacts to hau kāinga include the loss of land and access to traditional resources, loss of mahinga kai species, mātauranga, cultural identity and consequential impacts on social, economic and cultural wellbeing.

Specific examples are provided in the case studies in Section 4 of this report.

GEOTHERMAL EXPLOITATION AND BORE CLOSURE PROGRAMME

The first geothermal wells were drilled in the 1920's. By 1985, over 376 wells were in use (Bay of Plenty Regional Council, 1999). Many of these were shallow wells (<200m).

While the geothermal field is subject to natural changes (e.g. earthquakes), it was evident through observations, supported by scientific monitoring, that geothermal extraction was having a significant adverse impact on geysers and springs. For example:

- Changes in geyser behaviour – eruptions of the iconic Pōhutu Geyser were less vigorous and frequent. Other geysers ceased to erupt completely: Te Horu (1972), Papakura (1972), Waikite (1967), Wairoa (1940).
- Changes in ngāwhā behaviour – Korotiotio, which supplied the oil baths in Whakarewarewa Village, stopped overflowing in the 1960s. Parekōhuru, which also supplies the oil baths, stopped overflowing in 1987. Waikorua was closed in the mid 70's because water levels had dropped so low the ground became unstable.

The decline in geothermal health was significant such that government intervention was needed. According to Gresham, Cox and Chung (1983), tangata whenua were not involved, or consulted with, in relation to an interagency ministerial taskforce report, which recommended that geothermal bores should be closed.

Between 1986 and 1988, the bore closure programme involved:

- Revoking local city control over geothermal bores.
- Closing and grouting all geothermal bores within 1.5km of Pōhutu geyser.
- Closing all geothermal bores owned by a government department in Rotorua.
- Requiring all bores to be licenced and reinjection of geothermal fluids to moderate depths (>50m).
- Introducing a royalty system for geothermal energy use.

In total, 235 wells were closed. One hundred and twelve of these were domestic wells supplying approximately 1,110 users. In one case, a domestic well supplied 95 users. In contrast, 123 commercial wells were closed which supplied approximately 187 users (Bay of Plenty Regional Council, 1999).

The bore closure programme was deemed successful in that it resulted in increased geothermal aquifer pressure and recovering of geyser and spring activity (Bay of Plenty Regional Council, 1999; Scott, 2019).

While the focus of this programme was the protection and restoration of geothermal taonga, there were significant and long-lasting impacts to hau kāinga across Rotorua who lost prized geothermal resources for bathing, home heating, healing and cooking. It also saw the loss of access to geothermal wells for home heating for entire central city suburbs.

The process and cost of licensing, constructing a reinjection bore, and paying a royalty fee, meant that domestic well owners could not afford to keep their wells open.

“The government of the day told Rotorua residents that they could have their bores turned back on but at a cost of \$18,000 per year plus more money to update and maintain the bores (systems) on a yearly basis”

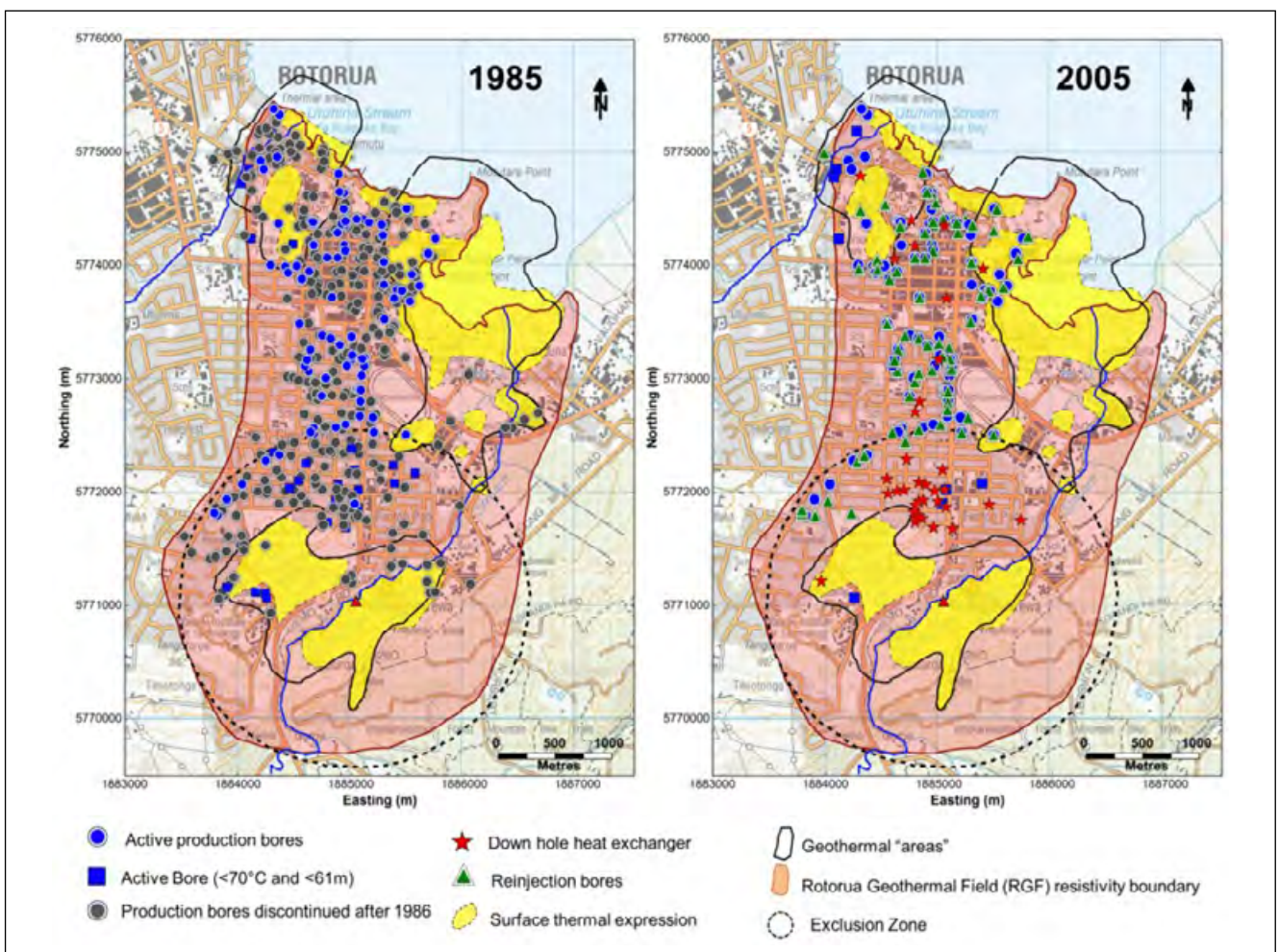
New Zealand Herald, 2012

In contrast, the density of bores for commercial use (hotels/motels) did not decrease over the same time, “reflecting the ability of the commercial facilities to pay the resource rentals” (Bay of Plenty Regional Council, 1999).

Hau kāinga note a feeling of frustration and disempowerment from those who are trying to improve social and cultural outcomes for whānau.

“Considerable hurt and resentment expressed that commercial interests are taking the resource and using it at great volumes and making money from the resource but tangata whenua bores were closed down and local baths don’t work.”

Pūngao Ngāwhā Kōrero engagement meetings, Aug-Sep 2019



Location of Production Wells in before and after the bore closure programme
Bay of Plenty Regional Council, 1999



SECTION FOUR

CASE STUDIES

Hau kāinga perspectives are presented using four case studies: Whakarewarewa, Ōhinemutu, Ngāpuna and the Tārewa Pounamu. While some of the geothermal uses at each area are similar, their geothermal landscapes, experiences and observations vary.

WĀHI RANGAHAU 1

WHAKAREWAREWA

Te Whakarewarewa valley, comprising Whakarewarewa – The Living Māori Village and Te Puia, is one of the most famous and photographed geothermal areas within New Zealand. Treasured by Ngāti Wāhiao, Tūhourangi and Ngāti Whakaue, it is an area full of active geothermal features, including puia, ngāwhā and mud pools.

The focus of this section is the Whakarewarewa thermal village ('village').

HOW HEALTHY ARE GEOTHERMAL TAONGA?

Te Whakarewarewa valley is home to numerous puia and ngāwhā.

TOHU

All of the geothermal tohu listed on page 14 of this report apply to this area. These indicators are sensory and based on what is seen (or not seen), heard (or not heard) and felt.

Those living and working at Whakarewarewa observed, felt and knew the nature of their geothermal taonga. They are repositories of knowledge, knowing intimately the names, stories as well as the daily / weekly / annual changes of each puia and ngāwhā.

All of these features are named, and in some cases revered.

"When you arrive at one of Rotorua's geothermal areas, locals want to talk about the features like they are talking about their family. They might say 'Oh Korotiotio [geyser] is getting a bit grumpy, or something like that.'" New Zealand Herald (2012)



Whakarewarewa

Huia Te Hau noted in her brief of evidence (Waitangi Tribunal, 2008):

"Ngāti Wāhiao can name every hot pool, mud pool, geyser, fissure, and stream, knowing how they are connected to each other and 'their respective function, the daily physical associations' – all these things, we were told, providing 'a rich tapestry of knowledge, understanding and commitment, which for our people over time strengthens our identity': who they are, where they are and why."

The village tour guides are often acknowledged as those with mātauranga regarding geothermal taonga.



Geothermal features at Whakarewarewa Village (Lloyd, 1975)

“They must be versed in the knowledge of the areas to be able to share the stories of Te Whakarewarewa and life here.

They must have knowledge of the geysers because the geysers and hot springs here have a lot of history.”

Mauriora Kingi on Waka Huia, 2016

“Because our people have everyday interaction with the geothermal, they were used as monitors by various scientists so on a day- to- day basis, two or three times a day, you were getting very exact scientific readings of the geothermal activity.”

Roku Mihinui on Project Mātauranga, 2016

In the time leading up to the bore closures of the 80’s, the health of a puia and ngāwhā were declining. A number of features disappeared completely.

“My parents, especially my father who grew up in Whaka, said there were 28 geysers on the geothermal field. Back in 1986, there were only about five that were erupting, the highest of which is the magnificent Pōhutu, but it was not reaching the heights it was capable of”. Tahana, Grant, Simmons, & Fairweather (2000)



PUIA / GEYSERS

The following observations are based on specific puia:

PŌHUTU GEYSER

Pōhutu has been the largest active geyser in the southern hemisphere since 1940 (when Wairoa last erupted). It erupts around 20 times per day at a height of about 30 metres.

While this is an improvement on its declining health in the 80s, Pōhutu is much less active than in the past where its height was about 40 metres. Prior to erupting, the ground would shake intensely, such that it could be felt at the village baths.

“These days, the shaking hasn’t been as noticeable as it used to be. Pōhutu has lost its intensity while erupting”. R. Mihinui, personal communication, 24 July 2020

WAIKITE GEYSER

The last observed eruption of Waikite was in 1967. It still bubbles and steam is observed intermittently but overall is subdued.



Waikite Geyser, Whakarewarewa. Ref: 1/2-001487-G. Alexander Turnbull Library, Wellington, New Zealand. / records/23132297



Waikite Geyser, Whakarewarewa as it is today

PAPAKURA GEYSER

Papakura returned in 2013 after being dormant for 34 years. An eruption was last observed in 1972.

“These days, Papakura is active but does not reach anywhere near its original heights – it boils rather than erupts”. R. Mihinui, personal communication, 24 July 2020

WAIROA GEYSER

Wairoa was previously the largest geyser in the southern hemisphere. Stafford (1986) noted that during the 1800’s, Wairoa geyser was perhaps the greatest geyser, sometimes sending water 200 feet (60m) into the air.

The last natural eruption was observed in 1940, after which the water level dropped 4.5m below the overflow. Waikite started to overflow again in early 1996. These days, Wairoa still bubbles but is subdued.



Wairoa Geyser, 1900-1910
Photo credit: James Blencowe, Te Papa collection

NGĀWHĀ

The following observations are based on specific ngāwhā:

PAREKŌHURU

Parekōhuru is the largest ngāwhā, which:

- supplies hot water to the oil baths.
- is used for cooking.
- is used to prepare harakeke (flax) for weaving i.e. by softening the flax fibre ready for use for weaving of mats or baskets.

Parekōhuru stopped overflowing in 1987 but recovered following the bore closures.

“I recall growing up in the village and Parekōhuru did start overflowing again within a 2-4 year timeframe. There was a time when our top baths were not used because Parekōhuru’s water level was too low. It didn’t return quickly, in fact there was quite a lot of discussion within the pā to see what could be done about lowering some of the natural pool edges to get a small flow of water down the channel to feed the baths.” S. Porter, personal communication, 21 July 2020

Parekōhuru was more active in the hours leading up to the Whakaari eruption in December 2020. It was observed that water levels seemed very high and it appeared that the overflow pool to the baths was overflowing.

Likewise, during NZ’s level 4 lockdown in March/April 2020, water levels at Parekōhuru were very high.

“There were small fluctuations, however it appeared that Parekōhuru and Korotiotio ngāwhā were very active and the sulphur deposits surrounding the ngāwhā returned. Due to the large volumes of foot traffic that would traverse the area, these deposits had not been sighted prior to lockdown.”

S. Porter, personal communication, 21 July 2020

KOROTIOTIO

Korotiotio ngāwhā, which translates to mean “grumpy old man” is ferocious with his violent bubbling and rumblings of the water. The tumultuous waters are revered by piupiu makers due to its effectiveness in getting harakeke prepared prior to staining.



Korotiotio in 2014

Photo source: E. Conroy

Korotiotio hasn’t supplied the oil baths since the 1960’s. These days, the water level still has not reached the point of overflow.

“When I was a child growing up in the village, the surrounding area of Korotiotio was actually blocked off from the public, because of his volatile nature. The violent rumblings of Korotiotio would sometimes throw boiling hot water into the air and onto the paths.”

It is only in recent times, within the last 10-15 years that the walking track has been re-established. The steam in this area is very dense and can prevent a person from seeing 1 metre in front of them. This area is monitored closely by whānau and the commercial business in the village to ensure public safety.”

S. Porter, personal communication, 21 July 2020

TE-ROTO-A-TAMAHEKE

The state of Te-Roto-a-Tamaheke was covered in the bathing section of this case study.

WAIKORUA POOL

Waikorua was closed in the mid 70’s because the water levels had dropped so low that the ground became unstable. There has been no change since then.

TO WHAT EXTENT HAS THE USE OF GEOTHERMAL TAONGA CHANGED?

For the purpose of this report, four tohu were used:

- **Cooking and Preparation** – can we cook like we used to?
- **Wharekai use** – can we cook at our wharekai like we used to?
- **Bathing** – can we bathe like we used to?
- **Home and wharenuī heating** – can we warm our houses and wharenuī like we used to?

COOKING AND PREPARATION – CAN WE COOK LIKE WE USED TO?

The villagers have had continuous and uninterrupted access to geothermal energy for cooking via steambox.

Currently, there are 6-8 steam boxes in Whakarewarewa village itself, all with differing temperatures.



Steambox cooking at Whakarewarewa Village, 1908
Source: Alexander Turnbull Library, Wellington

The three steam boxes that are closest to Parekōhuru are the main ngāwhā used for cooking at the Village. These are the hottest, with the ones further from Parekōhuru known to be like warmer drawers, or a natural microwave. These would typically be used for food already cooked and needing to be heated.

“For some of our whānau living in the village, they don’t have the luxury of having a kitchen, an oven or even a microwave. Therefore, cooking in the steamboxes is a daily event for some residents and their whānau. Other whānau are lucky enough to have a kitchen and running water their homes in our home, however they will still have a steambox kai at least 2-3 times a week, primarily to fit in with our busy schedules because of the convenience; prepare the kai in either a pot or muslin cloth and put into the steambox. The food will only take 3-4 hours to cook, however if left there a little longer there is no risk of it burning”. S. Porter, personal communication, 21 July 2020

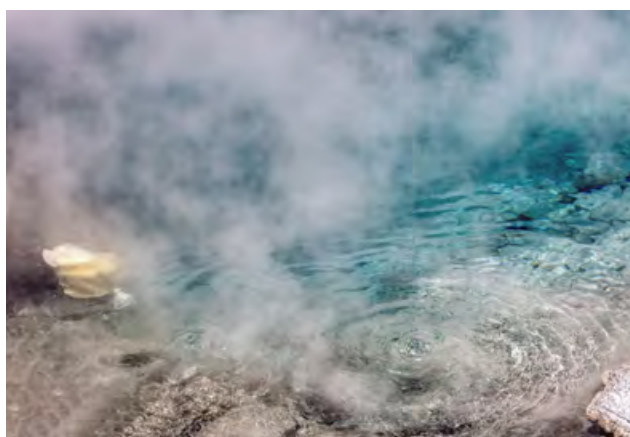


Steambox at Whakarewarewa village in 2014
Photo source: E. Conroy

There are approximately 60-65 residents that live within the village with hundreds of descendants that live outside of the village in surrounding suburbs of Rotorua. Whānau that live outside of the village also have access to the village geothermal resources.

“Being a resident within the village, we often see the comings and goings of whānau who are utilising the steamboxes and ngāwhā, and that number would easily be between 30-70+ individuals per week. This would also depend on what might be happening in a week or month, where whānau functions might also be cooked in the steamboxes, particularly birthday’s, fundraising events, etc. S. Porter, personal communication, 21 July 2020

Parekōhuru is the main ngāwhā used for cooking at the Village. Over the years of commercial development within the village, the ahu whenua trusts that govern within the village have agreed to a commercial license; whereby the commercial business has access to use the steamboxes and Parekōhuru ngāwhā between the hours of 8am-5pm daily, to cook hangi and corn on the cob to sell to tourists.



Cooking corn

There is a steam box close to Pōhutu geyser. With no residents residing at Te Puia or in the valley, it is primarily used for cooking for tourists and visitors.

There have been mixed observations around the impact of the bore closures of the late '80s on the steamboxes.

“It used to take up to three hours to cook a chicken in the village’s five steamboxes.

Since the bore closures, one of the bores became so hot it cooked a chicken in about an hour-and-a-half and sometimes blew the heavy wooden steam box lid off”.

McFarlane (2007)

“The ever changing environment of Whakarewarewa definitely was impacted by the bore closures of the 80’s, however was seen more in the sense of water levels and the continued use of the baths. The steamboxes, whilst they definitely were affected, have been able to continually be used in one way or another even if the temperatures fluctuated”.

S. Porter, personal communication, 21 July 2020

WHAREKAI USE - CAN WE COOK AT OUR WHAREKAI LIKE WE USED TO?

While whānau still have access to ngāwhā and steamboxes for cooking, the bore closures of the late '80s meant that the wharekai for Whakarewarewa Village lost its geothermal bore and was forced to use gas and electricity to cook and heat water.

Like other geothermal villages, this was due to the financial cost associated with meeting the new legislative requirements.

This had, and continues to have, cost implications to the marae committee.

There is still significant resentment for the loss of access to the geothermal resource for the wharekai, whānau and manuhiri (visitors), particularly with the neighbouring commercial hotel using the resource for pool and space heating for guests.

BATHING - CAN WE BATHE LIKE WE USED TO?

The use of geothermal baths for bathing, relaxation and healing continues within Whakarewarewa village, primarily at the Hīrere (or bottom / waterfall) and oil (or box) baths.

The oil or box baths in particular, are used to treat ailments such as arthritis, lumbago and rheumatism.



Oil / Box baths in 2020
Photo source: E. Conroy

The **Hīrere** (bottom bath) is fed from **Te Roto-a-Tamaheke**.

“Throughout my lifetime, the bottom bath closed, prior to the bore closure programme. This was primarily due to the hot water bay drying up, the water wasn’t reaching the bay, to in turn fill up our bath. Even after numerous people trying to re-channel the water to no avail.

It did take quite some time for the resource to return after the bore closure.” S. Porter, personal communication, 21 July 2020

These days, the baths are used daily by approximately 15-20 families who reside in the village. The numbers utilising the baths increase in the winter months and during winter sports to 100-200 people per week. It is noted that Te Roto-a-Tamaheke has been steaming more than usual during the April 2020 lockdown (when tourism and commercial use had largely ceased) which meant the water filling the Hīrere bath has been hotter than usual.

The **Blue Lake** or **Blueys** are a popular swimming hole for whānau. It is located below Pōhutu Geyser and collects warm water runoff from the geysers.

“The water levels of the blueys are significantly lower than they used to be in comparison to what it was in the 60’s and 70’s in my Dad’s time. The current state of the Blueys now is how my siblings and I grew up knowing it” S. Porter, personal communication, 21 July 2020

“We noted at the same time that it was occurring [lower levels at Te-Roto a-Tamaheke] with what we used call the Blue Lake which was the big lake that, in its deepest part was around about 15 feet that sat below the Pōhutu geyser in the background and you might be able to see the high water mark still showing on the silica terrace”. Roku Mihiniui on Project Mātauranga, 2016



High-water mark on the silica terrace shows how the water level has dropped at the Blueys
Photo source: Science Learning Hub

Te Roto-a-Kanapanapa is also known as the Green Lake in Whakarewarewa. Historically, kōkōwai was obtained from this pool (Stafford, 1994). It is not a bathing area for living but instead a place to bathe and prepare tūpāpaku (deceased) for tangihanga and burial.

“The water is very cloudy, murky and light green in colour with different parts of the lake visibly hotter than others...only recently learning about the geothermal system that exists in Whakarewarewa, was it realised that the acidity of that lake and feature was an integral part our most famous geothermal feature today, Pōhutu geyser is able to continue to play for many years to come.” S. Porter, personal communication, 21 July 2020



HOME AND WHARENUI HEATING - CAN WE WARM OUR HOUSES AND WHARENUI LIKE WE USED TO?

HOME HEATING

There are approximately 25 houses in the village. None of these homes are currently or had been heated geothermally. Therefore, they were not affected by the bore closures.

This does not include the number of caravans that are dotted around the village which some whānau occupy.

The only houses that were geothermally heated prior to the 80's were those that still had dirt floors and or those where that were built close to steam vents, which for those times were for heating; however in today's times, would be responsible for dampness, mould and condensation.

“The geothermal environment and how unpredictable it is in Whakarewarewa, makes building houses, planning and developing infrastructure difficult.

Building consents from local councils and installing utilities like water and electricity is tricky to say the least, so the primary way for whānau to heat their homes in the village today, is via electricity.

In this environment it isn't recommended to have a heatpump, because of the ongoing maintenance issues with sulphur eating into wiring etc, which makes for an expensive exercise when heating a home within the village. S. Porter, personal communication, 21 July 2020

WHARENUI HEATING

It is widely known that there are a number of ngāwhā located under the wharenuī, Wāhiao. While it is warm inside the wharenuī, ongoing maintenance has required governing bodies to find more permanent ways to secure the foundations of the wharenuī.

WĀHI RANGAHAU 2

ŌHINEMUTU

Ōhinemutu, on the southern shores of Lake Rotorua, is the much-envied stronghold and principal pā of Ngāti Whakaue who gifted the land on which the city of Rotorua was built.

HISTORICAL CONTEXT

Ōhinemutu pā is considered a jewel in the crown of Ngāti Whakaue due to the abundance of natural resources including the plentiful, diverse and sustained geothermal activity and fresh water and food sources once provided by the Utuhina stream and Lake Rotorua.

The proliferation of warm baths, boiling springs and steam to cook food, and warm ground to heat homes and grow crops (kūmara, potato, maize, tobacco) were a source of wealth amongst the tribe and demonstrate the extraordinary role of geothermal energy in enabling self-sufficiency.

Historical accounts from visitors to the village also note how clean the air was at Ōhinemutu due to the lack of smog from wood fires.

“Our old people knew the innate medicinal properties of certain ngāwhā and, whenever they felt tired or sick, they knew to go down to the waiariki for therapy. Many of the larger or more voluminous ngāwhā were named and even had their own known temperaments, their own personalities. To this day, a few of the old people will still greet and talk to the various waiariki.”

Manley, 2019



Steam box at Rūāpeka Bay, date unknown

Over many generations, Ōhinemutu whānau have learned to live safely in balance within their geothermal environment. It is part of their way of living, their way of being.

“Our use of the ngāwhā was guided by tikanga and kawa, our cultural protocols and norms that were handed down to us by our forefathers. These protected both the ngāwhā and the physical and spiritual well-being of the users, as well as helped pass along knowledge of how particular ngāwhā acted under certain conditions such as rain, flooding, or long dry periods.” Manley, 2019

“We rely on what we see, hear, smell and feel, and we know when things are changing. We still retain elements of our traditional mātauranga because we live here and observe things daily, but it is impossible to maintain the deep understanding that our grandparents had when ongoing “development” means nothing remains in its natural state.”

L. Kereopa, personal communication, September 2020

HOW HEALTHY ARE GEOTHERMAL TAONGA?

All of the geothermal tohu (indicators) listed below apply to Ōhinemutu:

- Changes at Te Rūāpeka bay – changes to water level, water quality, shape (of bay), temperature and activity e.g. hydrothermal eruptions.
- Presence (and absence) of geothermal features.
- Frequency, location and height / strength of hydrothermal eruptions and road blowouts.
- Behaviour of ngāwhā e.g. Is it overflowing or not? Is it bubbling more than usual?
- Temperature of ngāwhā e.g. Is the water cooler than usual?
- Water texture e.g. How it feels to touch.
- Strength of ground shaking i.e. associated with hydrothermal eruptions.
- Any changes in smell?

TE RŪĀPEKA (BAY)

Te Rūāpeka, in the heart of Ōhinemutu, is the most precious and significant natural geothermal feature within the village. The warm lagoon, once surrounded by a pristine beach, was a treasured community meeting place for bathing, swimming and socialising.

The pool is fed by a number of ngāwhā, the biggest of which is Waikite, and is normally cooled by the waters of Lake Rotorua.

“Observations regarding the waiariki at Ōhinemutu were often noted in the diaries of early Colonial visitors. Reverend W.R. Wade visited in 1834 and wrote: Some of the springs are of such a temperature as to form a perpetual warm bath. In these, men, women, and children crowd together, regardless of all decency, chatting as they sit almost up to their chins in warm water; smoking their pipes, and taking their food as if they were on dry land...”

The people will often sit in these warm baths three or four hours at a time; and occasionally, in cold days of idleness, they will remain the whole day in the water, having food brought to them, and fire to light their pipes.” Manley, 2019

In 2016, the Rūāpeka became completely cut off from the lake by an increasing build-up of sediment as a result of erosion occurring around the lake and throughout connected rivers. Whānau also suggest that the Okere gates may have also been an influence. This has resulted in the lagoon heating up, being polluted by discharges from stormwater drains and local baths, and ultimately becoming a health and safety hazard for residents and visitors alike.

As a result, this has impacted not only the health and wellbeing of the geothermal feature, but also hau kāinga. The people of Ōhinemutu believe a number of geothermal eruptions that have occurred within Lake Rotorua at the entrance to the Rūāpeka since 2016 are due to sedimentation smothering natural geothermal vents within the lake.

Higher water levels and hotter temperatures are also believed to be contributing to the erosion of banks along Muruika Urupā (Soldiers Cemetery).

As of 2020, there are now two generations of Ōhinemutu whānau who have never bathed or swum in the Rūāpeka.

When considering the overall health of geothermal features and areas locally, mātauranga Māori tells us that everything is connected from White Island through to Tongariro, and that all water - including freshwater, seawater and geothermal are part of one system.

“Councils must find ways to ensure mana whenua and especially ahi kā are actively involved in all aspects of hot and cold-water management across the “Taupō Volcanic Zone” including planning, monitoring and decision-making.” F. Clubb, personal communication, September 2020



Te Rūāpeka (photos provided by L. Kereopa)

TO WHAT EXTENT HAS THE USE OF GEOTHERMAL TAONGA CHANGED?

While ample heat, hot water and steam continues to exist within Ōhinemutu, the prohibitive costs of maintaining bores, hot water pipes and heating, bathing and cooking infrastructure now means a majority of whānau within the village have lost their ability to access geothermal home heating, cooking and bathing. This has had significant negative and long-lasting implications on the health, social and cultural wellbeing of whānau.

“Our ancestors chose to live in these places for a reason. It meant they could access heat, water and kai, but now we can’t access these things and our people are suffering.” L. Kereopa, Te Ahi Kaa Roa meeting, 19 February 2020

The following are key matters that influence the use of geothermal taonga:

- Changes to heat, steam, quality of water, and water levels at puna that feed bathing pools and cooking pools/boxes.
- Whether geothermal bores are in use or not.

For the purpose of this report, four tohu apply:

- **Home heating** – can we warm our houses like we used to?
- **Cooking** – can we cook like we used to?
- **Marae use** – can we heat and cook at our marae like we used to?
- **Bathing** – can we bathe like we used to?

HOME HEATING - CAN WE WARM OUR HOUSES LIKE WE USED TO?

Geothermal was once an accessible, affordable and sustainable source of heating within Ōhinemutu so many homes were not insulated. Many whānau who have now lost their access to thermal heating, have been left struggling to keep their homes warm using cheap forms of heating such as gas heaters.

COOKING - CAN WE COOK LIKE WE USED TO?

Only a limited number of whānau continue to have access to areas for cooking using geothermal steam and water as there are fewer places to do so than in the past.



Geothermal cooking at Ōhinemutu
Photo source: L. Kereopa

Steam boxes throughout the village are no longer operational mainly due to the excessive costs of maintenance and repair.

MARAE USE - CAN WE HEAT AND COOK AT OUR MARAE LIKE WE USED TO?

Due to ongoing and exorbitant bore maintenance costs, Kaimatai, the new wharekai at Te Kuirau marae, no longer has a steam box. Since it was rebuilt in 2018, all cooking has had to be done using gas. This affects mātauranga, with the loss of intergenerational knowledge and practices associated with steam box cooking.

“There has been a loss of traditional knowledge because we’ve had a gap in undertaking those practises, so they’re not being passed down between generations as they once were. As kids you were raised to know how to do things like cook in a steam box, but when there are no steam boxes, you can’t pass on those skills. That knowledge of how to use the resource and what to be careful of, it all just disappears.”

Te Ahi Kaa Roa meeting, 19 February 2020

The wharenuī and wharekai at Te Kuirau marae now utilise heat pumps instead of the original geothermally-heated steel radiators.

The use of gas and electricity has cost implications for the marae committee and hapū.

BATHING - CAN WE BATHE LIKE WE USED TO?

Ōhinemutu once enjoyed a large number of areas for bathing. These days, only a limited number of whānau continue to have access to areas for bathing as there are fewer places to do so than in the past.

“There have been a number of pools that I can remember as a young man that were once filled with hot water that have since dried up. I can only put this down to the number of bores that have been issued by the council over the years particularly for hotels and motels and the tourism industry. The use by Ngāti Whakaue of the geothermal resource has not changed, but the effects of overuse elsewhere has seen a decline in the resource available.” Raana, 2005, as cited in Waitangi Tribunal, 2008



Ōhinemutu Bathing Pool, date unknown
Source: New Zealand Tourist Department

A number of baths have also been unused for decades due to the costs of licencing, the royalty scheme as well as repairing or re-drilling bores and/or installing reinjection bores.

“I remember as a child going to different baths throughout the pā with my dad as he caught up with different cousins while having a soak. It was as much a social thing to do as it was for actual cleansing.

Most of those baths have been empty or gone for 20+ years now. There are now so few left in working order, that our whānau don't want to be a burden on those who still have running baths.

And it's absolutely heartbreaking and wrong to see our people now having to pay to go for a soak in commercial pools in town.

Meanwhile outside of our villages, many non-Māori are enjoying the benefits of geothermal heating and bathing in their homes and businesses.

I get angry in the knowledge that our geothermal taonga has become a rich man's resource.”

L. Kereopa, personal communication, September 2020

Whānau also note a feeling of frustration and disempowerment from those who are trying to improve social outcomes for tangata whenua with reduced access to their geothermal taonga for bathing and home heating.

“Motels have thermal pools; we no longer do. We have limited or no influence to improve the outcomes for our people.” Te Ahi Kaa Roa meeting, 19 February 2020

Ngāti Whakaue ki Ōhinemutu whānau believe the answers lie in better management and utilisation of the geothermal resource overall.

“In this day and age that means bigger, communal heat exchanges; reinjection of fluid back into the aquifer; and more effective piping systems and wells. We can lead and show the way. It's so important that mana whenua are involved in the management of our geothermal taonga moving forward to ensure more energy-efficient geothermal systems are put in place, and more equitable and sustainable access to the social and economic benefits of the resource.”

F. Clubb, personal communication, September 2020

Better management also means councils actively acknowledging mātauranga Māori by working with hapū and iwi to implement changes to current management systems to ensure the taonga is used, shared and protected for future generations in a way that is consistent with the values and practices of hapū and iwi who have sustainably utilised our geothermal taonga for generations.

WĀHI RANGAHAU 3

NGĀPUNA

Ngāpuna is the home and heart of Ngāti Hurunga Te Rangi. It is located east of the Rotorua Central Business District with housing and marae dotted amongst the multitudes of mills and workshops. There are no obvious geothermal remnants (e.g. steam), not like what you see at Ōhinemutu or Whakarewarewa. This is in contrast to how Ngāpuna used to be, where streams and wetlands were plentiful.

HISTORICAL CONTEXT

The name 'Ngāpuna' (which means the place of many springs) is testament to the abundant springs, both cold and warm, within the area.

The given name of the place describes the obviously unique natural resources of the place. Kāinga settlements, fisheries, and cultivations were established close to the valued geothermal activity; spring water tributaries, and wetland ponding formations along the lakeshore of Rotorua. These physical resource establishments proceeded northward across the land to the old Pā Ōwhatiura. Puarenga Stream is the main awa of the area which reaches the lake at Te Pāpā-o-Ruāmoa.

While this report is focused on the health of geothermal taonga, it is essential to understand the historical context of Ngāpuna.

This is because the development of Rotorua and the industrialisation of Ngāpuna has severely affected the relationships of hau kāinga with their lands, waters and geothermal taonga.

For example:

- Alienation of land – whānau moved away from Ngāpuna due to the 1941 typhoid epidemic; individualisation of Māori land title by the Māori Land Court; industrial zoning of the village by the District Council in the late 1960s and subsequent conversion of land to industrial use by non-Māori landowners.
- Impacts of industrial land use on air and water quality (refer photo right) as well as the health of hapū members, flora and fauna. This includes the dumping of sawdust at Te Pāpā o Ruamoā until 1988 (P. Staite, personal communication, 25 June 2020).



Drain, between McAlpines Sawmill and Ngāpuna residential area, which is the main source of water for the wetland at Te Pāpā-o-Ruāmoa. Note the woodchips suspended in the water. 6 January 2004. Photo by Russell Kirkpatrick. (Kirkpatrick, Belshaw, & Campbell, 2004)

- Contamination of the Puarenga Stream from upstream land use and discharges. This includes PCP and dioxins from the Red Stag (former Waipā) Mill site stormwater runoff and discharges as well as spray irrigation of treated wastewater to the Whakarewarewa Forest. Prior to 1991, treated wastewater was discharged to Puarenga Stream (Kirkpatrick, Belshaw, & Campbell, 2004).
- Abstraction of water from the Puarenga Stream (Hemo Spring) to town supply purposes.
- The District Council's former municipal landfill and present sewage treatment plant are located at Te Arikiroa, Sulphur Point.
- Designation of land in 1963, between Te Ngae Road and the lake edge, for roading purposes. The Rotorua Eastern Arterial Route project was abandoned in 2017, following decades of opposition by hau kāinga.
- Diversion and excavation of the Puarenga Stream for flood protection purposes.

Kirkpatrick, Belshaw, & Campbell (2004) highlight the uniqueness of combining residential and industrial zone land:

“The combination of industrial and residential zones is rare in New Zealand. Newer developments segregated residential and industrial zones to avoid environmental and quality-of-life issues affecting residents.

However, in this case it seems the convenience of Māori land and the relative political invisibility of tangata whenua has contributed to the present situation.”

The impacts of industrialisation and pollution of Ngāpuna are long lasting and intergenerational.

“The truth of colonial oppression and deprivation of the geothermal resource from us at Ngāpuna has

obviously left a huge scar on at least 3 generations of tangata whenua here at Ngāpuna”. P. Staite, personal communication, 25 June 2020

“Our hapū have paid a high costs in terms of quality of life and physical health from the industrialisation of Ngāpuna over the last 120 years”. Hurunga Te Rangi Marae and Ngāpuna A 2nd Residue Trust, 2011

“For Ngāpuna it’s not about loss of our ngāwhā, we still have that and they’re not going away, it’s the opposite here. Ngāpuna is the loss of other things. So that makes the geothermal that is left and cared for all the more important.” Te Ahi Kaa Roa meeting, 11 March 2020

Whānau are making do with what little is left of their geothermal taonga. As a result, Ngāpuna whānau can access some areas for cooking and bathing but these are severely limited in number.



Aerial map illustrating the scale of change at Ngāpuna over the last 75 years.



Land use at Ngāpuna, in relation to geothermal and freshwater taonga
 (Kirkpatrick, Belshaw, & Campbell, 2004)



Te Pāpā-o-Ruāmoa, March 2020. Photo source: E.Conroy

HOW HEALTHY ARE GEOTHERMAL TAONGA?

Like Whakarewarewa, Ngāpuna whānau know how to live within, and adapt to, a geothermal environment. It is part of their way of living, their way of being.

With the exception of geyser behaviour, all of the geothermal tohu listed on page 14 of this report apply to this area. Specifically:

- Changes observed at ngāwhā at Te Pāpā-o-Ruāmoa – water level, temperature and level of activity.
- Presence (or absence) of specific vegetation or fauna (e.g. namunamu).
- Changes to temperature and water levels at puna that feed the bathing pools.

ENVIRONMENTAL CONTEXT

P. Staite provides the following environmental context (personal communication, 25 June 2020):

“Beyond Opoporete on its right bank and Kohaturoa on the left, the weight of the Puarenga river mouth inflows into lake Rotorua, push through heavy concentrations of geothermal, mineral, and spring water combinations of Puarenga Bay and given the tupuna placename descriptive called “Te Awaiti”, in a northeast direction.

In the distant right of the mouth is evidence of pumice and silica flats formations following the Tarawera eruption volcanic dust cover and washdown from the upper Puarenga catchment.

In recent times this area was surveyed and partitioned off and given the name Te Pāpā-o-Ruāmoa, with a mix of natural features from fresh springwater inflows, surface water drainage, geothermal vents, hot pools and mud features. The adjacent lakebed has hot spot eruptions across the Puarenga Bay towards Sulphur Bay on the west and along the southern shoreline, appropriately named Te Arikiroa.

Combined with the geothermal, sulphur and mineral inputs from Whakarewarewa, Te Awaiti adds the most volume of geothermal elements to Lake Rotorua. Visible by the huge plume of whitish-grey discolouration of the larger lake water mass, it is very obvious looking from the shores of the Puarenga Bay and as far as Rotorua Airport on occasions.”

TE PĀPĀ-O-RUĀMOA

Te Pāpā-o-Ruāmoa, a geothermal area of significance, is located on private land and only accessible to Hurungaterangi whānau. The 19ha block is largely untouched with sinter flats, steam vents, mud pools and ngāwhā. It also includes a rare geothermal wetland.

Whānau have observed that parts of Te Pāpā-o-Ruāmoa have become more active over the last 10 years (L. Hall, personal communication, 11 March 2020).

TO WHAT EXTENT HAS THE USE OF OUR GEOTHERMAL TAONGA CHANGED?

For the purpose of this report, four tohu were used:

- **Cooking and Preparation** – can we cook like we used to?
- **Bathing** – can we bathe like we used to?
- **Home and Marae heating** – can we heat and cook at our marae like we used to?
- **Geothermal features and areas** – are they in good health?

COOKING AND PREPARATION - CAN WE COOK LIKE WE USED TO?

Ngāpuna whānau have dedicated areas for in-ground cooking (tao tunu kai²); food preparation (i.e. to singe pigs or make it easier to pluck chickens); as well as to prepare ingredients/materials for rongoā (e.g. harakeke, paopao) and weaving (raupō, harakeke). Each area has a specific use, which may change over time, depending on the level of geothermal activity.

The use of steam boxes was an everyday activity until about the late 1970's onwards. Due to water quality issues stemming from industrial land use in Ngāpuna, in-ground and steam box cooking is now limited to special occasions. Like Ōhinemutu, this results in loss of intergenerational knowledge and practices associated with these methods of cooking.

BATHING - CAN WE BATHE LIKE WE USED TO?

The number and use of bathing pools has changed significantly over time.

“Back in the 20’s, 30’s, 40’s, 50’s, 60’s, 70’s whānau were using the baths morning, afternoons and evenings. 300 plus people per week, had six functional baths at different temperatures which all whānau whakapapa to. Late 70’s, huge decline in the use of the baths.

During the cold season, increase of bath use 80 people during the week. Summer season, less bath use 50 per week. Now whānau have indoor baths and showers no need to bath out in the elements.

Our bathing areas were also a community gathering catch up on wats happening around the village, passing of loved ones, births, unveilings, working bee up at the marae, land meetings, Council and the changes that effect Ngāpuna residents”. L. Hall, personal communication, 29 June 2020

These days, only three bathing pools remain, and are in use, in Ngāpuna.

“...swimming holes...were used by the claimants when they were children, but are now so polluted they are avoided, and the Ngāpuna residents have let the tracks become overgrown so their own children can’t find the pools.” Kirkpatrick, Belshaw, & Campbell, 2004

There are significant odour, air quality and water quality issues in this part of Ngāpuna. This, in turn, impacts the safety, enjoyment and use of the remaining bathing pools.

One example is the Ngāpuna or Top Bath (photo top p.37), which is surrounded by light industrial land use, including a truck yard and truck wash facility, multiple sawmills and a waste transfer station. Impacts include:

“...seepage of oil, diesel and other substances finding its way on to the site. Whānau need to drain and clean the inside of the bath for health and safety reasons. And needing to build around the bath or privacy reasons”. L. Hall, personal communication, 29 June 2020

2 “anywhere you could dig a hole or find steam”



Ngāpuna / Top Bath

HOME OR MARAE HEATING - CAN WE WARM OUR HOUSES AND MARAE LIKE WE USED TO?

None of these homes or marae in Ngāpuna are, or have been, geothermally heated. This is due to the inhibiting factors of cost and regulations for hau kāinga.

The rezoning of Ngāpuna saw some industrial property owners construct geothermal bores for their purposes, previously not tapped by Ngāpuna residents (P. Staite, personal communication, 25 June 2020).



TĀREWA POUNAMU

Tārewa Pounamu, which includes Tārewa Road and Kuirau Park, has been a home for Ngāti Kea Ngāti Tuara for generations. Whānau took advantage of the many natural geothermal features in the area - they knew which pools were safe. They understood, and lived with, the changing nature of the geothermal pools - the changing depths (deep to shallow) and the changing temperatures, and they lived with that. There were no baths in the houses in the Tārewa area, so the families bathed in the hot pools or the Utuhina Stream.

HISTORICAL CONTEXT

Tārewa has been a kāinga of Ngāti Tuara since the 1600s. Taharangi has been the whare tupuna since 1905, although the first meeting house recorded at Tārewa was Whakarewa, which was built in 1878.

Over time, whānau based at Horohoro were increasingly moving to Rotorua for work opportunities and following the influenza epidemic (1917-18). Around 1918, the whare tupuna, Kearoa, was relocated from Horohoro to Tārewa, alongside Taharangi. Kearoa remained at Tārewa until 1932 when it returned to Horohoro.

Over the last 130 years, the hau kāinga have lost land, geothermal taonga as well as access to remaining geothermal taonga as a result of events including:

- Ground drainage works in the 1890s, when the railway line was constructed, which lowered groundwater levels.
- Drilling and use of geothermal wells from the 1920s onwards, which reduced system pressure and resulted in the loss and/or degradation of geothermal features.
- Partitioning of lands by the Māori Land Court in the mid to late 1940s, which enabled the selling off of whānau lands.

- Acquisition of Tārewa East lands, including Tārewa East 3B10 (a marae reservation) by the Rotorua City Council in the 1960s as an addition to Kuirau Reserve. A claim was made to the Waitangi Tribunal in 1988 for wrongful acquisition of the lands.
- Filling in of old ngāwhā by the city council.
- Bore closures of the 1980s, where hau kāinga lost the ability to heat, bathe and cook geothermally.

These actions have had detrimental and long lasting impacts on the wellbeing of hau kāinga.

HOW HEALTHY ARE GEOTHERMAL TAONGA?

Tārewa Pounamu has always been a centre of much thermal activity. A report in the Auckland Star (28 February 1934) stated:

“There was a spectacular blow-out in the Kuirau Reserve at the back of the meeting house in Tārewa Road some three weeks ago. It was a blow-out beside an existing spring, leaving another pool about 8ft in diameter. Both pools remained quiescent from that time until yesterday morning at eight o’clock, when they became agitated and overflowed vigorously every few minutes, then subsiding.”

This was continued till noon, when both pools went up with a roar throwing mud and rock 25ft in the air. This play continued for an hour, then it ceased suddenly. No damage was caused.”

The springs and mudpools of Tārewa Pounamu have been mapped extensively by scientists. According to Cody (1998), some 57 geothermal features were mapped in 1953 although it was unlikely to be a complete survey. By 1998, 175 geothermal features had been mapped and catalogued.

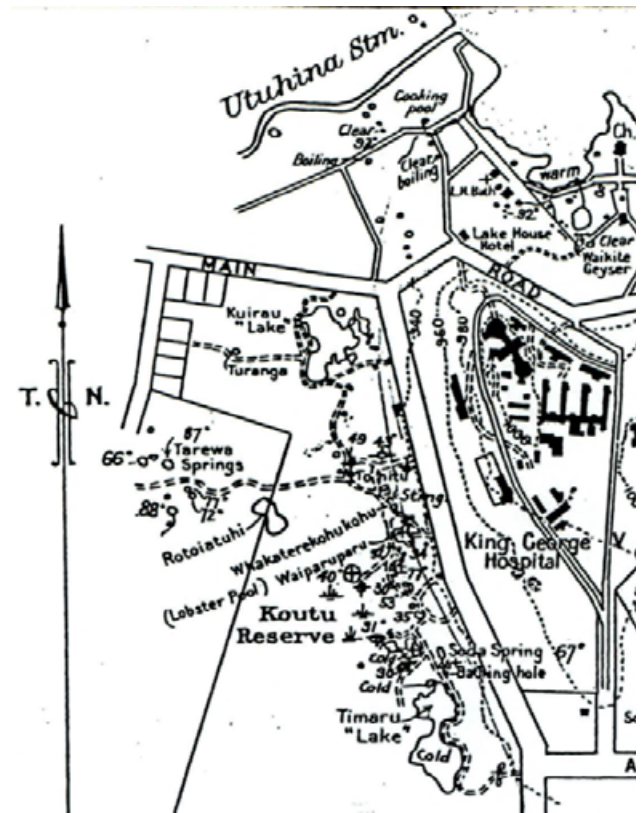
However, the mātauranga around the resource is not well known, recognised or provided for. For example, there are a number of taniwha who live in the geothermal pools but very few people today know the names.

A range of tohu (indicators) can be used to describe the health of geothermal taonga at Tārewa Pounamu. This could include the following:

- Continued presence of ngāwhā or mudpools
e.g. do they still exist?
- Behaviour of ngāwhā or mudpools
e.g. are they bubbling more or less than usual?
- Water temperature
e.g. is it cooler or hotter than usual?
- Presence of kānuka which indicates cooler water.
- Frequency and strength of hydrothermal eruptions.

There used to be many ngāwhā on the east side of the sections bordering what became Kuirau Park. For example, there was an old ngāwhā next to 12 Tārewa Rd and every year it used to blow up and overflow. The residents had a hose and they used to let the water run 24 hours a day and keep the ngāwhā cool, and after about a week it would settle down.

By the 1980s, Kuirau Lake rarely overflowed. It was also surrounded in kānuka trees, an indication of reduced geothermal activity. While the bore closure programme of late 1980's resulted in recovery in heat and pressure for geothermal taonga at Tārewa Pounamu, including Kuirau Lake, the development and urbanisation of land has meant that a number of geothermal taonga have changed or are inaccessible.



1936 map of Tārewa Pounamu geothermal features.
Source: Cody (1998)

“Take for example the natural surface feature adjacent to the marae. This was something that people could walk around and be safe. The council allowed housing to be built there and it turned into a disaster, and now it is fenced off and a bund put up around it although this is Ngāti Kea Ngāti Tuara reserve land.” Ngāti Kea Ngāti Tuara trustees, personal communication, May 31 2018

The quote above also references the construction of houses in the 1970's on land with dormant geothermal springs and vents. Following the bore closure programme, reservoir pressure restored and, in this area, geothermal vents refilled and ngāwhā returned and overflowed (Gordon, O'Shaugnessy, Grant-Taylor, & Cody, 2001).

Numerous hydrothermal eruptions occurred in 1998 and 2000.

“Yesterday morning, a brand new ngawha - or natural water hole - erupted just metres from a house at number 24, resulting in a 5.30 am visit from the Fire Service. A few hours earlier its big brother - a thermal pool next door on a Māori reserve at number 22 - vented its spleen again. Numbers 16, 18, 20, 22 and now 24 have had a taste of geothermal action over the past two years. Eight eruptions in two months early this year led to a meeting between Rotorua District Council and Environment Bay of Plenty staff and landowners from local hapū to discuss safety measures.” New Zealand Herald, 2000

In total, four houses were demolished on Tārewa Road, as a result of the 1998 hydrothermal eruptions.

Parekaumoana ngāwhā is now fenced off from whānau and bunded, which severely impacts the relationship of hau kāinga with geothermal taonga.



Kuirau Lake, taken from Pukeroa Hill - looking towards Mt Ngongotahā. This photo was taken in 1885 by Burton Brothers studio and recently coloured by Nostalgic Rotorua.

Photo source: Te Papa (C.013435).

TO WHAT EXTENT HAS THE USE OF OUR GEOTHERMAL TAONGA CHANGED?

The use of geothermal taonga in the Tārewa Pounamu area has changed significantly over the last 60 years. The tohu (indicators) that relate to the ability of the hau kāinga to:

- Cook and bathe at homes and at the marae using geothermal water or energy.
- Physically access geothermal water or energy i.e. via ngāwhā or bore.
- Heat their homes and the marae.
- Use geothermal water for customary practices.

BATHING - CAN WE BATHE LIKE WE USED TO?

Of significance to hau kāinga are the Tārewa group of springs (particularly Parekaumoana), Kuirau Lake (formerly known as Taokahu) and all areas in between.

Whānau knew that there were natural rhythms and cycles with ngāwhā and adjusted their use accordingly.

“The Ngāwhā in the Kuirau heat up then cool down, on a regular cycle. As kids we used to follow them around - when Parekaumoana was too hot to bathe, we’d go to another one then work our way back to Tārewa as they cooled.” Ngāti Kea Ngāti Tuara, n.d.

These days, no bathing occurs at Parekaumoana or Kuirau Lake due to ngāwhā temperature. Access to ngāwhā is also restricted for safety reasons.

The original public bath, north east of Parekaumoana (known as Patel’s bath) was closed and concreted it over by Council.

Taharangi marae previously had a geothermally heated bathing pool. But this ceased following the bore closure programme (discussed overleaf).

Very few houses along Tārewa Road continue to have access to geothermal water for bathing.

CLEANING AND PREPARING - CAN WE CLEAN AND PREPARE LIKE WE USED TO?

Parekaumoana ngāwhā was well used by hau kainga until about the 1950's for clothes washing. The ngāwhā was valued for its clear, steaming hot water.

There used to be rocks at either end to enable whānau to access the water. This use ceased with the eventual transition to in-home washing machines.

At least one ngāwhā close to Taharangi marae is still used by weavers for flax preparation purposes.



HEATING AND COOKING - CAN WE HEAT AND COOK LIKE WE USED TO?

The majority of houses on Tārewa Road were connected to a geothermal bore for heating and/or cooking. Most houses lost this access following the bore closure programme.

"We can remember the day when 'they' came onto our land and poured concrete down our bore." Ngāti Kea
Ngāti Tuara trustees, personal communication, May 31 2018.

Likewise, Taharangi marae no longer has access to a geothermal bore for heating, cooking or bathing as it was closed and decommissioned in the late 1980's.

Hau kāinga continue to express considerable hurt and anger about the loss of access to the geothermal resource. No compensation was given for the loss of access and the cost of re-installing a bore is too cost prohibitive for whānau.

There is also a lot of resentment with commercial interests taking, using and making money off the resource, while local access is limited. An example is the Rotorua Aquatic Centre, which takes significant volumes of geothermal water and heat. Shared access would enable hau kāinga to geothermally heat, cook and bathe, which could benefit many whānau.

Today the people of Tārewa would like restore access to geothermal resources for domestic purposes, such as water for washing / bathing and home heating as well as for potential commercial purposes.

SECTION FIVE

CONCLUSION

Hau kāinga of Whakarewarewa, Ōhinemutu, Ngāpuna and Tārewa Pounamu have lived within an ever-changing geothermal environment for hundreds of years. Because hau kāinga live within their respective geothermal areas, they know and see the natural rhythms of geothermal taonga. All of these features are named and personified with stories passed down through the generations. They know when the health of geothermal taonga is diminishing or increasing, based on their appearance and behaviour.

Documenting hau kāinga perspective on the health and wellbeing of geothermal taonga has been essential to build a more comprehensive understanding of long term trends in the system health, tohu, customary uses, and management principles.



ARTICULATING GEOTHERMAL HEALTH

While there are similarities in what is measured by hau kāinga and western scientists (e.g. behaviour of geothermal features), the Māori worldview highlights that the environment and all it sustains (including people) is interconnected and cannot be looked at in isolation.

From a hau kāinga perspective, describing geothermal health is wider than the 'physical health' of the resource as it includes the wellbeing of associated whānau and communities. This is in large part because the collective health and wellbeing of hau kāinga is intrinsically linked with the mauri of wai (water) and whenua (land). Both aspects are connected and cannot be looked at in isolation.

THE FINDINGS

For hau kāinga, geothermal surface features were a traditional source of resource for heat / water / healing. The behaviour, and impacts of use, of the geothermal surface feature could be observed easily.

The installation and use of bores impacted surface features and the traditional methods used by hau kāinga to access and utilise their taonga-tuku-iho.

While there has been mixed recovery of geothermal taonga since the bore closure programme of the '80s, there has been a significant change and reduction in geothermal use by hau kāinga. This is due to the cumulative and intergenerational impacts of local and central government actions (and in some cases, inaction) associated with land use and development within the city as well as the bore closure programme imposed in the late 80s.

This in turn has severely impacted the relationship of hau kāinga with geothermal taonga and removed or affected access for cooking, bathing and heating. As a result, there have been significant and long lasting impacts on the social, cultural and physical wellbeing of hau kāinga.

Although the bore closure programme was in place to restore the health of geothermal taonga, the restrictions disproportionately affected domestic well owners who could not afford the cost of licensing; reinjection bore construction and paying the high royalty fee.

This resulted in:

- Whānau losing their sole source of heating, particularly at Ōhinemutu and Tārewa Pounamu.
- Communal bathing pools remaining unused for decades.
- Marae losing access for heating and cooking (i.e. steamboxes).

Hau kāinga note a feeling of frustration and disempowerment from those who are trying to improve social and cultural outcomes for whānau.

This includes:

- Economic burden of utilising alternative energy sources.
- Inability to manage and use the resource themselves.
- Loss of mana and rangatiratanga over their taonga tuku iho.
- Significant negative impact on social cohesion and spiritual wellbeing.
- Loss of knowledge and practices associated with geothermal taonga.
- Inability to adapt mātauranga, tikanga and kawa over time.
- Inability to practice manaakitanga.
- Imbalance in community wellbeing.

WHAKAREWAREWA VILLAGE

Geothermal is the only cooking and bathing source for many whānau in Whakarewarewa Village.

The Parekōhuru cooking pool continues to overflow into the village oil baths, unlike Korotiotio which hasn't overflowed since the 60s. It is notable that Parekōhuru was particularly active in the hours leading up to the eruption of Whakaari.

Pōhutu geyser continues to erupt, albeit not as vigorously as in the past. Papakura geyser returned in 2013 but is subdued and a number of geysers have never returned.

The bore closures helped to restore water levels within Te Roto a Tamaheke and re-establish flows to the Hīrere bath. Te Roto-a-Tamaheke was also seen to be steaming more than usual following the April 2020 lockdown, when tourism and commercial use had largely ceased.

As a result, the water filling the Hirere bathing pool has been hotter than usual.

Whakarewarewa continues to enjoy uninterrupted access to geothermal energy for cooking via steamboxes.

ŌHINEMUTU

The prohibitive costs of maintaining bores, hot water pipes and heating / bathing / cooking infrastructure now means a majority of whānau within the village have lost their ability to access geothermal home heating, cooking and bathing.

This has had significant negative and long-lasting implications on the health, social and cultural wellbeing of whānau. It also affects mātauranga, with the loss of intergenerational knowledge and practices associated with steam box cooking.

Geothermal features have also been lost or changed due to urban and industrial development. Infilling and sedimentation have seen the degradation and loss of use by hau kāinga of Te Rūāpeka, the premier natural feature within Ōhinemutu village.

NGĀPUNA

Industrial zoning of a residential papakāinga by Rotorua Lakes Council resulted in Ngāpuna (named for its wealth of natural springs) being left with just one area where geothermal taonga have not been polluted and destroyed. This area, named Te Pāpā-o-Ruāmoa, is located on privately-owned Māori land. Parts of Te Pāpā-o-Ruāmoa have become more active over the past 10 years.

The industrialisation of Ngāpuna also severely affected air, land and water quality as well as the health of hapū members, flora and fauna. Associated impacts on the relationships of hau kāinga with their lands, waters and geothermal taonga are long lasting and intergenerational.

In-ground and steam box cooking, an everyday activity until the late 1970's, is now limited to special occasions due to water quality issues stemming from industrial land use within the village.

Like Ōhinemutu, this results in loss of intergenerational knowledge and practices associated with these methods of cooking.

Significant odour, air and water quality issues impact the safety, enjoyment and use of the three bathing pools that remain and are in use in Ngāpuna.

Inhibitive costs and regulations mean none of the whānau and hapū have been able to afford to use the available geothermal energy to heat their homes or either of the two marae that sit within the village.

TĀREWA POUNAMU

The bore closure programme of late 1980's resulted in recovery in heat and pressure for geothermal taonga at Tārewa Pounamu, including Kuirau Lake. Hydrothermal eruptions became a regular occurrence in 1998 and 2000, resulting the demolition of four houses on Tārewa Road following the 1998 hydrothermal eruptions.

While the bore closure programme helped to restore the health of geothermal taonga, it had detrimental and long lasting impacts on the wellbeing of hau kāinga. Taharangi marae and the majority of houses on Tārewa Road lost access to geothermal bores that were used daily for heating, bathing and/or cooking.

Hau kāinga continue to express considerable hurt and anger about this loss of access. There is also a lot of resentment with commercial interests taking, using and making money off the resource, while local access is limited and expensive. Restoring shared access to geothermal energy would enhance hau kāinga and community wellbeing.

LEARNINGS

The process of collating cultural views, perspectives and observations about the state of the geothermal resource, and the changes in use within Rotorua, has included challenges, frustrations and learnings for both council and hau kāinga alike.

Consultation and engagement of this kind is often the first opportunity that hau kāinga have had to share the history of what has happened to their people, their lands and resources; to tell their stories and experiences; to describe their sense of loss; and communicate the hurt, pain, and anger felt by generations of their families.

The sharing, collating and summarising of information accumulated over decades or generations has also had its challenges.

And there has been added frustration that a lot of the information already available to council, in the form of Waitangi Tribunal Reports, Iwi Environmental Management Plans, and Cultural Impact Assessments have not been investigated and collated prior to approaching hau kāinga for further input.

It is hoped however that the knowledge and mātauranga shared by the Te Ahi Kaa Roa representatives will help to enable a more holistic and culturally responsive approach to future planning, monitoring and management of the Rotorua Geothermal System.



An aerial photograph of a geothermal landscape. A vibrant blue river flows through a dense forest of green trees. In the upper right, a paved road with a few cars is visible. A wooden walkway with railings runs along the edge of the river in the lower right. Wisps of white steam or mist rise from the ground near the river.

SECTION SIX

WHERE TO FROM HERE?

This report highlights that the knowledge of those living within geothermal environments is invaluable to guide the long-term management and monitoring of the Rotorua Geothermal System. This knowledge is area specific and informed by hundreds of years of lived experiences and observations.

This section outlines a pathway forward to enable a more holistic and culturally responsive approach to future planning, monitoring and management of the Rotorua Geothermal System.

A TREATY PARTNERSHIP APPROACH TO GEOTHERMAL MANAGEMENT

Understanding the health of the resource, and impacts on hau kāinga, can provide insight into desired outcomes and principles for future management and monitoring of the Rotorua Geothermal System. This includes:

1. Protection of the rights of hau kāinga to restore and maintain access to their geothermal resources.

This means supporting hau kāinga to regain / retain the use of their geothermal resources for cultural activities including heating, bathing and cooking. The right to “restore geothermal resources” also means the restoration of the rights of hau kāinga as kaitiaki to manage, utilise and protect their natural resources.

2. Protection of the rights of hau kāinga to manage and protect their traditionally held geothermal resources which includes the ability to ensure their sustainable use.

This means mātauranga Māori being utilised equally alongside western science in any system management plan.

It also includes hau kāinga being resourced and supported to play an equal role alongside Council in:

- Monitoring the use of geothermal resources.
- Managing the impacts of industry / tourism on geothermal resources.
- Managing the resource consent process involving geothermal resources.

3. Implementation of a values-based approach to geothermal allocation to enhance social and cultural outcomes and make a tangible difference to people’s lives.

This means ensuring that allocation and future use of geothermal taonga is for people and communities first.

This involves prioritisation of use for:

1. Tangata whenua – cultural activities – marae, heating, cooking & bathing then,
2. Rotorua ratepayers – heating, cooking & bathing, then,
3. Community facilities / organisations i.e. schools, hospitals, then,
4. Industrial / Commercial.

4. Recognition of legal requirements and obligations under the Treaty of Waitangi, Resource Management Act 1991 and Local Government Act 2002.

The Māori worldview, based on mātauranga Māori, is that all water including freshwater, geothermal and seawater is part of one system; and geothermal from Whakaari through to Tongariro is part of this one, interconnected system.

This means councils must find ways to ensure hau kāinga are actively involved in all aspects of hot and cold water management across the “Taupō Volcanic Zone” including planning, decision-making and monitoring.

GUIDING PRINCIPLES

The following principles are suggested to guide the way in which the Rotorua Geothermal System is managed, including future allocation.

We need to ensure that geothermal planning and decision making:

- is intergenerational – for our children and mokopuna.
- reflects our place in the world – we are part of the taiao; our geothermal taonga are a living entity (not just a resource) and our tuākana.
- strives for balance and reciprocity – this means working within the natural limits of the environment and giving back (i.e. restore what is taken; take action to offset effects).

We also need to ensure that geothermal planning and decision making recognises and incorporates cultural values such as:

“whakapapa (genealogy), mana (authority, right, power), tapu (sacred or controlled), noa (common, open), kawa (Māori protocol/lore), tikanga (practice), and mauri (life force) provide understanding and guidance for environmental balance and sustainability” (He Koha Kii Ltd, 2019).

NEXT STEPS

Te Ahi Kā Roa will continue to work with the Council in relation to:

- Policy development e.g. Rotorua System Management Plan and future Regional Plan Change.
- Potential research and monitoring projects.
- Monitoring practices, data analysis and interpretation.
- Resource consent processes.
- Decision-making.

From a policy development point of view, more work is needed to further articulate the position of hau kāinga in relation to:

- Priority of allocation (as outlined in Section 6.1). This should include consideration of priority allocation for those activities which enhance social outcomes but are often considered commercial activities (e.g. kaumatua housing, kohanga reo, kura kaupapa).
- Customary takes, as provided for by Section 14(3)(b) of the RMA.
- How to embed mātauranga Māori and the above principles into geothermal policies and rules.

Potential research and monitoring projects could include:

- Hau kāinga-led geothermal monitoring at each respective area. This includes developing or confirming geothermal tohu.
- Collecting more information about the behaviour and recovery (where applicable) of puia and ngāwhā.

The above information will inform the plan development process and any future ‘state of geothermal health’ reporting (such as this report).

Where monitoring is carried out by hau kāinga, discussions will need to be held about how any shared data is used and protected.

BIBLIOGRAPHY

- Bay of Plenty Regional Council. (1999). Rotorua Geothermal Regional Plan. Whakatane: Bay of Plenty Regional Council.
- Bay of Plenty Regional Council. (2019). He Korowai Mātauranga: Mātauranga Maori Framework. Whakatane: Bay of Plenty Regional Council.
- Bay of Plenty Regional Council. (2019). Te arotake i ngā whakahaere o Te Waiariki o Rotorua: Reviewing management of the Rotorua Geothermal System. Nga take me nga whiringa: Issues and options. Whakatane: Bay of Plenty Regional Council.
- Boast, R. P. (1992). The hot lakes: Maori use and management of geothermal resources from the evidence of European visitors. A report to the Waitangi Tribunal.
- Cody, A. D. (1998). Geothermal Report on Kuirau Park. Prepared for Rotorua District Council and Environment Bay of Plenty. Rotorua.
- Doorman, P., Bhana, R., & Camburn, F. (2020). Finding the Balance: Community Engagement in the Development of the Rotorua System Management Plan. Proceedings of the World Geothermal Congress. Reykjavik.
- Gordon, D. A., O'Shaughnessy, B. W., Grant-Taylor, D. G., & Cody, A. D. (2001). Rotorua Geothermal Field Management Monitoring. Environment Report 2001/22. Report prepared for the Bay of Plenty Regional Council. Whakatane: Bay of Plenty Regional Council.
- Graham, G. (1921). Arawa Notes: Obtained from Te Miroi, of Ngati-Tunohopu; hapu of Ngati-Whakaue. The Journal of the Polynesian Society, 30(20), 256-258.
- Gresham, P., Cox, O., & Chung, C. (1983). Management of Geothermal Resources: Issues and Options. Paper No. 1983/1. Wellington: Commission for the Environment.
- He Koha Kii Ltd. (2019). Geothermal Plan Review: Review of Iwi and Hapu Management Plans. Report prepared for the Bay of Plenty Regional Council. .
- Hurunga Te Rangi Marae and Ngāpuna A 2nd Residue Trust. (2011). Cultural Impact Assessment: Rotorua Eastern Arterial. Rotorua.
- Kirby, M. (2019). Te Ruapeka - The People's Voice. Report prepared for the Bay of Plenty Regional Council.
- Kirkpatrick, R., Belshaw, K., & Campbell, J. (2004). Land-based cultural resources and waterways and environmental impacts (Rotorua, Taupo and Kaingaroa) 1840-2000. A report commissioned by the Crown Forestry Rental Trust. Hamilton: University of Waikato.
- Lloyd, E. F. (1975). Geology of the Whakarewarewa hot springs. NZDSIR Information Series No. 11. NZ Department of Scientific and Industrial Research.
- Manley, B. (2019). Wai Ariki: A cultural narrative. Retrieved from Wai Ariki: Hot Springs and Spa: <https://wai-ariki.co.nz/cultural-connections>.
- Mongillo, M. A. and Clelland, L. 1984: Concise Listing of Information on the Thermal Areas and Thermal Springs of New Zealand. DSIR Geothermal Report No. 9, Wellington, DSIR Geothermal Coordination Group.
- Morton, J. (2015). Taste it: Serving up kai cooked in thermal wonderland. Retrieved from New Zealand Herald: https://www.nzherald.co.nz/lifestyle/news/article.cfm?c_id=6&objectid=11382155
- Neilson, G., Bignall, G., & Bradshaw, D. (2010). Whakarewarewa a Living Thermal Village – Rotorua, New Zealand. World Geothermal Congress. Bali.
- New Zealand Herald. (2000, September 19). Rotorua bore outbursts spur excitement. Retrieved from <https://www.nzherald.co.nz/nz/rotorua-bore-outbursts-spur-excitement/E7RATVYZHKRXXQP6WQVLUBWU2A/>
- New Zealand Herald. (2003). Eruptions at Kuirau Park. Retrieved from New Zealand Herald: https://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=3533007

- New Zealand Herald. (2012). Spectacular Rotorua geyser showing signs of life again. Retrieved from New Zealand Herald: https://www.nzherald.co.nz/nz/news/article.cfm?c_id=1&objectid=10821877
- Ngāti Hurunga Te Rangi and Ngāpuna A 2nd Residue Trust. (2011). Rotorua Eastern Arterial: Cultural Impact Assessment. Prepared by Ngāti Hurunga Te Rangi and Ngāpuna A 2nd Residue Trust.
- Ngāti Kea Ngāti Tuara. (n.d.). History of Tārewa. unpublished.
- Project Mātauranga. (2016). Restoring Rotorua's natural geothermal taonga. (Scottie Production) Retrieved from Science Learning Hub / Pokapu Akoranga Putaiao: <https://www.sciencelearn.org.nz/resources/1386-restoring-rotorua-s-natural-geothermal-taonga>
- Rotorua Daily Post. (2015). Rogue bore gets sealed off. Retrieved from Rotorua Daily Post: https://www.nzherald.co.nz/rotorua-daily-post/news/article.cfm?c_id=1503438&objectid=11503002
- Rotorua Daily Post. (2019). Rotorua mud pool, ground continues to collapse as shed in danger. Retrieved from Rotorua Daily Post: https://www.nzherald.co.nz/rotorua-daily-post/news/article.cfm?c_id=1503438&objectid=12244513
- Scott, B. (2019). The Science Story. Environmental Summary Report: Rotorua Geothermal System. Report prepared for the Bay of Plenty Regional Council. GNS Science.
- Scott, B. J., & Cody, D. A. (1997). Effects of Bore Closure at Rotorua, New Zealand. World Geothermal Congress. Japan.
- Stafford, D. (1994). Landmarks of Te Arawa. Volume 1: Rotorua. Auckland: Reed Books.
- Tahana, N., Grant, K. T., Simmons, D. G., & Fairweather, J. R. (2000). Tourism and Maori Development in Rotorua. Rotorua Case Study. Report No.15/2000. Tourism Recreation Research and Education Centre, Lincoln University.
- Te Ao Maori News. (2015). Tunohopu Marae closed following geyser eruption. Retrieved from Te Ao Maori News: <https://www.teaomaori.news/tunohopu-marae-closed-following-geyser-eruption>
- Waitangi Tribunal. (2008). He Maunga Rongo. Report on Central North Island Claims (Stage 1). Volume 4: Te Taiao. The Environment and Natural Resources. Wellington.
- Waka Huia. (2016). Waka Huia - Whakarewarewa Living Maori Village. Retrieved from https://www.youtube.com/watch?v=WUcAFLQWF4s&ab_channel=Whakarewarewa-TheLivingMaoriVillage
- Waka Huia. (2016). You Tube. Retrieved from Waka Huia - Whakarewarewa Living Maori Village: <https://www.youtube.com/watch?v=WUcAFLQWF4s>
- Whakarewarewa: The Living Maori Village. (n.d.). Map and Information sheet about Whakarewarewa. Retrieved from Whakarewarewa Thermal Village: <https://whakarewarewa.com/wp-content/uploads/2019/06/RS02507-Whakarewarewa-EN-Guide-map-PRINT.pdf>

