CENTRAL HAWKE'S BAY
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04 October 2021

Anthony Tipene-Matua
atipene-matua@heritage.org.nz
**cc**: David Tipene-Leach
chair@ngatikere.com

Kia ora Anthony,

UPDATE AND CONFIRMATION OF PROPOSED WASTEWATER SOLUTION

This letter is an update on the consent process for the long-term wastewater solution at Pōrangahau and Te Paerahi and we seek your guidance on several matters.

Update
As you are aware the resource consents for our long-term solution have been lodged and are with the Hawke's Bay Regional Council. We are expecting they might have a few questions that require clarification and once we have responded and satisfied the information required, the consent will be publicly notified. This could happen within the next couple months, but more realistically this will happen early next year in 2022.

CIA
Thank you for your Cultural Impact Assessment. As per our exchange, we will be providing the CIA to the Regional Council. A requirement of discharge consents is a discussion and evaluation of how the proposal relates to obligations to Te Tiriti o Waitangi. Your CIA has been informative in assisting with this. Initially I indicated we might need further information but at this time we think what you have provided is sufficient. However, we may come back to you if the Regional Council have further questions.

Response
To assist with the discussion about the suitability of the proposed land site, it would be useful to have a tangata whenua view or statement on its suitability. We wrote to you on 8th July with a summary of the site visit in April 2021 and asked for confirmation the site notes were accurate. A copy of these are attached. Are these notes accurate? Particularly, we have proceeded with the application for this site based on the acknowledgement that the wider area is wahi tapu, and this included the chosen site.

Our recollection was that, and as noted by Ngāti Kere kaumatua, this site was the best location in the immediate area despite its limitations and proximity to the river, and we would need to ensure within the proposal and design that appropriate controls and measures are implemented to manage the site and areas of significance.

We look forward to your response.

Ngā mihi nui

**Darren de Klerk**
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Central Hawke's Bay District Council
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**Attachment:**
>Draft site notes – April 2021
>CIA – July 2021
>Discharge Conceptual Design – August 2021

**MEMORANDUM** **Job 10684**

**To**: Ngati Kere

**Project:** Porangahau and Te Paerahi Wastewater Upgrade

From: Hamish Lowe, LEI
Darren de Klerk, CHBDC

Date: 24 May 2021

Subject: Site meeting at Stoddart Farm – 17 April 2021

Detailed below is a very brief summary of the site meeting we had at the Stoddarts' farm to discuss cultural matters relating to the wastewater project.

The meeting was attended by the following:

- Anthony Tipene-Matua, Keri-anne Stephens and whanau, Don Tipene, Tip Tutaki, (Ngati Kere)
- Elizabeth Pishief (Heritage Services)
- Gordon Stoddart (Landowner)
- Darren de Klerk (CHBDC)
- Hamish Lowe (LEI)

We met at the Stoddarts' house and after a quick introductory discussion we toured the farm. A karakia was undertaken before accessing the farm.

The first stop was at a site with old large pits, or more accurately craters in the Aerodrome paddock. Gordon had been under the impression they were kumera pits. Elizabeth was less convinced, but conceded they were influenced by people. Of note was Gordon (and father) had not cultivated the area and with the exception of grazing they had remained largely intact. A further karakia was undertaken.

We then progressed to an old midden in the Lane paddock. This was one of a number of middens that Elizabeth had previously identified.

Third stop was in the Rough paddock beside a windblow, a location initially suggested by Gordon as a possible pond site. This remains a likely pond site.

The last stop was in the Cattle Yards paddock. Elizabeth had identified a couple middens in this area but we were unable to find them.

We had general discussion at this last location. This included the noting by Don that the entire area could be considered waihi tapu. He indicated that the entire river margin was of historical significance and there would have been occupation over the entire area. Gordon has uncovered artifacts and Don noted there were likely to be more, which everyone agreed with.

We spent some time discussing and considering if this was this the best site (farm). It was agreed that the Stoddarts' was likely to be the best of the bunch, especially with the need to manage winter discharges to land.

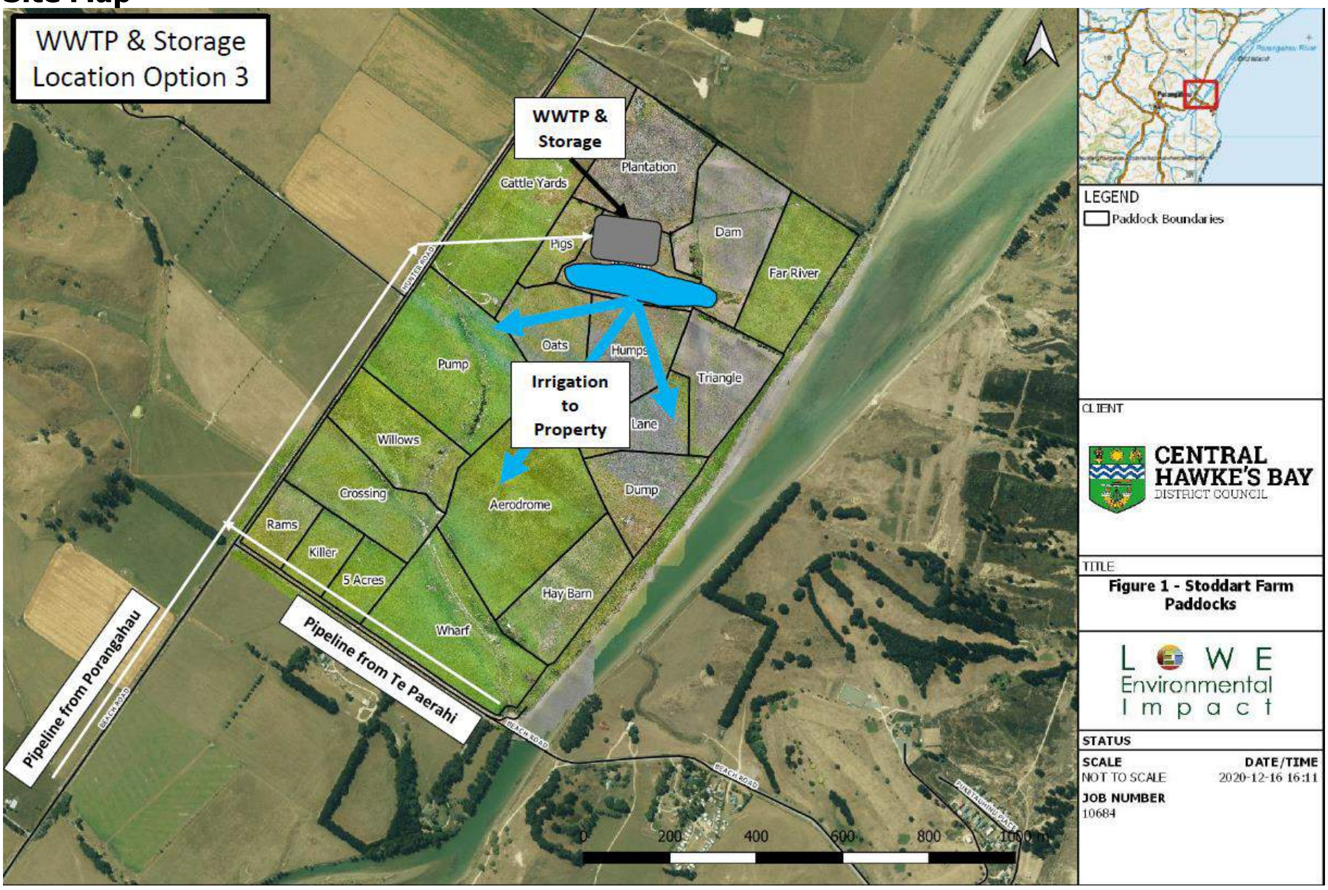
It was noted by me that if winter irrigation could not occur then there would be some form of river discharge. Don conceded that while not ideal, and being wahi tapu, the farm was probably the pick of the options and they would reluctantly support its use, simply as there were limited other options.

The use of the sand dunes in winter was supported, with a preference to stay as far as practically possible away from waterways and drains. Ideally the discharge area should be closer back towards Hunter Road (shown basically below).

There would need to be close observations during construction and appropriate management of any artifacts uncovered. Having an archaeological authority in place was critical.

We returned to the Stoddarts' for a brief (delayed) morning tea and final debrief.

**Site Map**



**Photos of Site Visit**

# CULTURAL IMPACT ASSESSMENT REPORT

## Te Paerahi & Porangahau Wastewater Management

Te Tore o Puanga
Māori Resource Management Unit
July 2021

# He Whakauruuru Whenua

Kia hīwara! Kia hīwara!
Te Paerahi, Parikoau, Te Upoko o te Haemata,
Takapau wharanui
e hora nei.
Pukepuketauhinu, Te Awakari ā Tamanui.
Piki ake ki te tihi o Oreorewaia.
te hononga o ngā wai tipua o Taurekaitai
ki Mākaramu
Ngāti Manuhiri, Ngāti Kere,
Ki te whāruarua o ngā toka kōrero
Ko Taikura tērā
Ko Ohinemuhu tērā
Ko Puhi ki roto, ko Puhi ki waho rā.
Tau ana ngā waka ki uta rā
ki Parikoau tau ana.
Tihe!

The ritual of tauparapara whakauruuru whenua (prayer) is an acknowledgement of the landscape when entering the domain of Porangahau, Te Paerahi. From the sacred rocks, down through the rivers to the ocean, where the water laps the shores, it pays homage to the realm of the ancestor Kere, the industrious provider.

**I a Kere te ngahuru,**
**Ka ngahuru noa atu!**

# Contents

## INTRODUCTION

This report is in response to the proposed waste management resource consent from the Central Hawke's Bay District Council (CHBDC) to the Hawkes Bay Regional Council.

This Cultural Impact Assessment (CIA) report was commissioned to examine and document Māori cultural values, interest and tīkanga that could potentially be affected by the wastewater management plan at Porangahau and Te Paerahi.

The CHBDC operate both the Porangahau and Te Paerahi waste-water treatment plants (WWTP). At present for Porangahau, wastewater is treated through an oxidation pond and discharged to the Porangahau River via a drain which was intended as a wetland. At Te Paerahi, wastewater is treated by an oxidation pond and then disposed to nearby sand dunes via soakage.

CHBDC is currently investigating options for future discharge of wastewater for each of these sites. They hold resource consent to discharge and treat wastewater from Porangahau WWTP to Porangahau River. Resource consent for the discharge of treated wastewater was granted by the Hawke's Bay Regional Council (HBRC) in October 2009 and will expire on 31 May 2021.

This Cultural Impact Assessment has been prepared by Te Tore Puanga Māori Resource management unit on behalf of the hapū of Porangahau, including Ngāti Kere in response to the proposal for waste management resource consent from CHBDC to the Hawke's Bay Regional Council.

### Purpose

The CIA, a technical report, provides an overview of the identification of cultural connections, associations and taonga with the site and the surrounding area, including the Taurekaitai River, Te Paerahi beach, Pukepuketauhinu wāhi tapu and surrounding wāhi tapu, as defined by Tangata Whenua, and how these may be affected by the new waste management systems and proposed works.

## Foundation Working Principles

These principles form the basis of the working relationship between Ngāti Kere and the CHBDC.

- **Ngāti Keretanga – Being Ngāti Kere**
  Ngāti Kere maintain their dignity and sovereignty over their traditional lands as kaitiaki and have the opportunity to advance their mātauranga where possible.

- **Te Whakawhitiwhiti kōrero – Open communication**
  Reports and communications are shared throughout the process. Ngāti Kere are resourced to ensure their perspective is included. Tikanga (protocols) are adhered to throughout the process. Parties adhere to a consultation protocol and the sharing of mātauranga (knowledge).

- **Kotahitanga – Working together**
  A collective stance for the benefit of Ngāti Kere in their ability to express their perspective and care of mātauranga and wāhi tapu will be maintained by both parties.

- **Te Pae tata – Taking Opportunities**
  Ngāti Kere are given full opportunity to fully participate and gain the best opportunity for Ngāti Kere tangata (people), Ngāti Kere whenua (land), Ngāti Kere rohe (environment), and Ngāti Kere mokopuna (future generations).

- **Whakarongo kia rongo – Listening to further understand**
  The views, wisdom, and knowledge of both parties will be listened to, shared, and respected. All parties have an understanding of, and are sensitive to, the views of others.

- **Te Oranga whenua**
  Ensure that environmentally friendly practices and processes are undertaken in all aspects of the project.

## RESOURCE MANAGEMENT ACT 1990

In achieving the purpose of this Act all persons exercising functions and powers under it, in relation to managing the use, development and protection of natural and physical resources, shall take into account the principles of the Treaty of Waitangi (Te Tiriti o Waitangi) [Section 8 RMA].

### The principles of Treaty of Waitangi

Much has been written about the Treaty of Waitangi. In particular there have been principles enunciated by the Court of Appeal, the Waitangi Tribunal and others. It has been recognised that this is a developing area of understanding and new principles will be deducted as further understanding of the meaning and intent of the Treaty is developed.

A list of principles which are primary significance for the District Plan process follows. This list has provided, and will continue to provide, guidance in the interpretation of section 8 of the Act.

To give effect to these principles this CIA report recognises:

i. **Partnership** needs to be maintained throughout all the functions and activities of the Council. Ngāti Kere are not merely an interest group in this instance but are the Council's partner.
ii. **Active protection** extends not only to matter relating to the recognition and protection of wai, wāhi tapu, urupā and sites of significance to Ngāti Kere, it also includes proactive policies relating to the maintenance and survival of tangata whenua culture and identity, and adequate resourcing for tangata whenua in resource management activities.
Proactive policies in relation to marae, urupā, papa kainga or whānau housing and the like, have been carefully examined with the cooperation of the tangata whenua.
iii. **Rangatiratanga** has been recognised and provided for. The particular resources and type control have been identified by tangata whenua in consultation with the Council. These matters include the management and control of wai, wāhi tapu and wāhi tupuna (ancestral sites) and the appropriate form of management and planning for adjacent areas.
iv. **Consultation** is an inherent process between Treaty partners that should be approached in a holistic manner. It is not an end in itself, but rather a means to take into account the relevant Treaty principles and the requirements in sections 6(e), 7(a) and 8 of the Resource Management Act in the decision-making process. Consultation in this context is not simply informing tangata whenua of impending actions. Consultation should be carried our as a positive process that ensures sufficient information of an adequate quality is available. Consultant requires Council to adopt an active role in consulting early and in good faith as implied in the principle of partnership.

# MĀORI WORLD VIEW

## Mātāpono Māori Values

Tangata whenua have a special connection with te taiao (natural environment). These connections are deeply rooted in Māori history, pūrākau (myth), and values. They are the foundations that let us recognise and protect the mauri (life essence) of all living things and ensures that the relationship between tangata whenua and the environment is embodied by respect and reciprocity.

The Māori provisions of the RMA place decision makers at the interface between Māori concepts and customs and Western culture and common law. Māori values and concepts, and the beliefs that underpin them, are imbedded in mātauranga Māori and Māori language.
The challenge is to interpret and define Māori values and concepts in ways that retain their integrity. This requires those performing functions under the RMA to appreciate and understand Māori world views. The RMA provisions recognise that Māori customary values and practices are relevant considerations.

An appreciation of Māori spiritual and metaphysical values is not only important as a means to understand mātauranga Māori, but also for RMA decision-makers, as these values are cultural beliefs which form part of the cultural and social well-being considerations under section 5 of the RMA and are protected as matters of national importance under section 6(e) of the RMA7.

In order to gain a clear understanding of why people behave a certain way, we must first understand how they perceive their own place in the world. It is essential to have an insight into their world, and their concepts of interconnectedness not only with other people, but also with their environment and all the things around them.

The following section of the report describes cultural values and concepts that are relevant to consider while proceeding in the actions of this activity.

## Māori and the natural world

In Māori tradition, all elements of the natural world are related through whakapapa. Māori world was created through the union of Ranginui and Papatūānuku.

Ranginui (Sky father) and Papatūānuku (Mother earth) were bound together in an eternal embrace. After deliberations and multiple attempts to split the couple, Tāne Mahuta (God of the forest) separated them and let in the light.

After the separation, the children of Ranginui and Papatūānuku went their own way; some stayed with Papatūānuku on the land, some retreated to the sky with Ranginui, and others made their own realms. They became atua (the gods) creating the world that we see today.

Thus, the connection that Māori have to the land, rivers, ocean and so on, can be traced back to the creation story, the story of Ranginui and Papatūānuku. Traditional Māori attitudes to the natural world reflected the relationships created through Rangi and Papa, that is, that all living things are descended from them, all living things have a whakapapa and are thus related. In support of this, the sense of interrelatedness between people and nature created a sense of belonging to nature, rather than being "ascendant to it", as the people are born from Papatūānuku, the earth mother, and return to her on their death.

This view of creation incorporates both the spiritual and physical elements of the created world, and we give thanks and pay homage to these atua through karakia (prayer), waiata (song), pūrākau (stories), and other ceremonies.

Although our tupuna were, at times, seen to test the boundaries of their relationship with the environment, a complex set of tikanga or rules, grounded in the spiritual world, ensured that they did not push this relationship too far.

## Māori Concepts

In the traditional Māori view, everything in the natural world has a **mauri** which is protected by kaitiaki or atua. Humans possess mauri ora, which is of a higher order than mauri, but this confers on the people a certain responsibility towards other living things. Preservation of the mauri of any element in the natural world is essential for its survival. Thus, tikanga governing conduct were established to ensure that the human use of a resource, such as the sea, or the land, did not affect its mauri.

The preservation of the mauri, or life force of the proposed area is of utmost importance to Ngāti Kere. The interaction of our tipuna with natural resources, such as the sea, the river, swamps, or the bush, was regulated through tikanga and concepts of tapu and rāhui.

- **Tapu:**

There are many examples and meanings of tapu (sacred, prohibited). Tapu is the power and influence of the gods, as everything was created by them. The land has tapu, as well as the oceans, rivers and forests. All living things have a form of tapu within them. It is important to keep in mind the things that are tapu, and things that are noa (unrestricted), or free from the extensions of tapu. All karakia conducted in ceremonies are one way of lifting the tapu and appeasing the gods.

- **Rāhui:**

Rāhui is a temporary form of prohibition that was used by our tipuna to preserve fish, shellfish, birds, or to protect any other natural resource. In many cases the rāhui was indicated by the erection of a pou rāhui, or post, which alerted and warned people against trespassing into the area of the rāhui. This system recognised the need to balance human need with the survival of a species or resource, and the protection of its mauri.

The authority or mana to exercise these tikanga was delegated through whakapapa to members of senior families. Their mana was reinforced by the people.

- **Mauri:**

As described above, mauri is the life force, or vital essence, of all things. In traditional Māori view, everything in the natural world has a mauri, including people, animals, mountain, rivers, oceans and more. Mauri makes it possible for everything to move and live within their own realm. When it comes to the natural environment, mauri may decline depending on the condition of that area. For example, if the cleanliness of a river is poor, and it is an unsafe area to take food from, then you could say the mauri of that river is lacking. The discharge of contaminants to water, or mixing of waters from different environments, can have harmful effects on the mauri of a waterway.

- **Te mauri o te wai:**

Tangata whenua have a special relationship with water. Water is considered to be the veins of Papatūānuku, it is also a crucial source of food and resources.

All things are considered to have the qualities of wairua (spirit/soul) and mauri, to be living. Mauri and wairua are important indicators in assessing environmental health at a physical and spiritual level and are used to assess the conditions of a recourse of place based on mātauranga Māori (Māori worldview). Large bodies of water, like ocean, rivers, and so on, play an important role to the survival of iwi and hapū. These waterways were used as a mahinga kai (food basket) that prolonged the livelihood of the iwi. Mahinga kai is usually described as a place where resources, like food and natural materials, are gathered.

- **Kaitiaki:**

The inter-connections between mana whenua and their natural world are expressed through mātauranga Māori me ōna tikanga that is authentic to each marae and hapū. This knowledge articulates an intimate understanding of the elements of nature and how they might communicate with each other. These include the Kaitiaki Atua or spiritual guardians representing the elements of nature which underpin the authentic health state of a waterway, land and sea. This knowledge was passed down through the generations (whakapapa-ranga in practice). Understanding the linkage was reflected in how well the hapū could engage in their relationship with the elements to utilize and to retain traditional knowledge on the authentic health state of their traditional lands, sea and waterways, to harvest and manage taonga wisely. Within the cycles of Te Taura Whiti I Te Reo Māori (following the phases of the Moon for planting, fishing, harvesting and other seasonal activities) is an excellent example of how Māori were highly attuned to the elements of nature.

Some examples of how the various cycles of the moon influenced various activities were:

**Tamatea-kai-ariki** a day for planting food, west winds prevail, that only rain will quell.

**Tamatea-a-ngana** eels are voracious feeders this night, a good day for planting food and for fishing but beware of the fog and the foaming sea.

**Tamate-aiho** Eel, fish and kumara are abundant but small, a productive day for collecting shellfish but fisherman beware.

**Tamatea Whakapau** a favourable day for planning food from morning to midday but not a day for the fisherman.

- **Kaitiakitanga:**

Kaitiakitanga is a term used for the Māori concept of guardianship, for the sky, the sea, waterways, and the land. It is often used to describe the connection between tangata whenua and the landscape. It is the rights and responsibilities associated with being mana whenua (territorial rights/ authority over the territory).

In the Resource Management Act 1991, it is defined as the following:

> *means the exercise of guardianship by the tangata whenua of an area in accordance with tikanga Māori in relation to natural and physical resources; and includes the ethic of stewardship.* Under Section 6(f),

In matters of national importance, in the RMA, it is defined as the following.

> *(f) the protection of historic heritage from inappropriate subdivision, use and development.*

- **Karakia:**

There are many types of karakia, and in ancient times all people used some form of prayer in daily life and on special occasions. Some karakia have special ritual functions, while others are used for protection, purification, ordination and cleansing.

- **Whakapapa:**

Whakapapa is the genealogical descent of all living things from the gods to present time. The meaning of whakapapa is "to lay one thing upon another" as, for example, to lay one generation upon another. Everything has a whakapapa: birds, fish, animals, trees, and every other living thing; soil, rocks and mountains also have a whakapapa.

Whakapapa is a basis for the organisation of knowledge in respect to the creation and development of things.

❖ **Whakanoa:**

Whakanoa is necessary to lift or nullify tapu. Whakanoa is the process of sanctification and nullification of tapu.

❖ **Tangata whenua:**

Tangata whenua is an important term - it means the people of the land: that is the Maori iwi or hapu (sub-tribes) which have mana whenua (customary authority) over a particular area.

❖ **Mātauranga Māori:**

The term mātauranga Māori literally means Māori knowledge and is closely aligned to the period of pre-European contact as it encompasses traditional concepts of knowledge and knowing that Māori ancestors brought with them to Aotearoa/New Zealand. The survival of the Māori language is a cultural and historical marker linking us back to this period and demonstrates a continuum from pre-contact to the present day. Post first-contact, mātauranga Māori evolved in important and significant ways as the ancestors encountered new environments and contexts such as flora and fauna, climate and geography and in terms of the need to respond to new technology, languages and cultures they had not known or experienced before.

❖ **Mana:**

Mana is the enduring, indestructible power of the gods. In modern times mana has taken on various meanings, including:

i. Mana atua - the power of the gods,
ii. Mana tūpuna - the power of authority handed down through whakapapa,
iii. Mana whenua - the power of associated with possession of the land (mana whenua), and
iv. Mana tangata - the power acquired by an individual according to his or her ability and effort to develop skills and to gain knowledge in particular areas.

# ORIGINS AND BACKGROUND OF NGĀTI KERE

## Nga tapuwae ā ngā Tipuna - A brief History

E kore e mōnehunehu te pūmahara ki ngā momo rangatira o neherā,
nā rātou nei i toro te nukuroa o Te Moana-nui-ā-Kiwa me Papatūānuku.
Ko ngā tohu a ō rātou tapuwae i kākahutia ki runga i te mata o te whenua,
he taonga, he tapu.

*Time will not dim the memory of the special class of men of the past,*
*who braved the wide expanse of sea and land.*
*Their sacred footprints are scattered over the surface of the land;*
*treasured and sacred.*
*– Sir James Henare*

Porangahau has a long, rich history and according to archaeological evidence, was one of the first known areas in New Zealand to be occupied. The kōrero tuku iho or history (whakapapa) and cultural values has been retained and documented with regards to Porangahau.

However, knowledge of Pōrangahau history and relationships with this area has been lost with the kaumatua of yesteryear, as many of these blocks were sold in the early 1850's and tangata whenua have lost much of this mātauranga.

Hence, an amount of research has been required to ascertain the full CIA of …. The benefits of such a report would not only educate and inform local authorities, but also future generations.

## Takitimu and Kurahaupō, Rangitane and Kahungunu traditions

Ngāti Kere have strong whakapapa links to the Ngāti Kahungunu and Rangitāne tribes. Rangitāne traces their origins to Whātonga, one of three chiefs who commanded the Kurahaupō waka. The Rangitāne tribe expansion throughout the country led to the saying:

'Tini whetū ki te rangi
Ko Rangitāne ki te whenua.
Like the multitude of stars in the sky
So great is Rangitāne on the land.'

As the tribe grew some hapū such as Muaupoko became tribes in their own right, but most hapū remained part of a wider tribal consortium that endures into the 21st Century. These hapū include Ngāti Kere, Ngāti Parakiore, Ngāti Hamua, te Rangiwhakaewa, Ngāti Mairehau.

In Pōrangahau the remnants of the seven or more small hapū who had survived into the 19th century renamed themselves, for the future of their marae and community and in self-conscious and in a small deliberate act as Ngāti Kere.[1]

All hapū will be taken into regard when dealing with RMA issues, however the main affected parties with regards to these Road works are Ngāti Kere, Ngai Tanehīmoa, Hinetewai, Ngāi Tamatea, and Ngāti Manuhiri.
The full list of hapū include:

[1] Ballara. Angela, IWI, The dynamics of Māori tribal organisation from c.1769 to c. 1945. P 233.

| | | | |
|---|---|---|---|
| Ngāti Maru | - Ouepoto | Ngāti Pakiua | - Parimahu |
| Ngāti Wharenui | - Parimahu | Ngāti Manuhiri | - Porangahau |
| Ngāti Kere | - Porangahau | Ngāti Pīhere | - Porangahau |
| Ngāi Tamatea | - Porangahau | Ngai Taanehimoa | - Poranhahau |
| Ngāti Hinetewai | - Porangahau | Ngāti Hineraru | - Whangaehu |
| Ngāti Hinepare | - Te Poroporo | Ngāti Te Rino | - Tautane |
| Ngāti Te Wheeki | - Akitio | | |

*The principle & traditional hapū associated with this is area are:*
*Ngāti Kere, Manuwhiri.*[2]

Traditional Māori principles of land rights and occupation could be based on discovery, conquest, gifting, and ancestral rights. Rights to land also required ahi kā (literally a lit fire) meaning inter-generational use and occupation of a place.
These hapū acquired authority over these lands through a number of take whenua (occupation rights), as recorded in the Native Land Court Minute books of the 1860's by several prominent Ngāti Kere tipuna.

'Ko taku mana i te whenua nei. My authority to this land is through':

| | |
|---|---|
| Whenua kite | discovery |
| Ahi kā roa | long-term occupation and use of the land |
| Makutu | death through incantation |
| Tuku whenua | gift |
| Raupatu | conquest |
| Mana tipuna | ancestral connection |
| Mana whakapapa | genealogical connection |

[2] The traditional name of Kokomau is Te Koko o Moko o Manuwhiri, the Tā Moko bowl of Manuwhiri. Manuwhiri or Manuhiri more commonly known is associated with the tipuna Manuhiri and that Hapū. They were based at Te Paerahi but Te Koko o Moko o Manuwhiri is a hill located in this area.

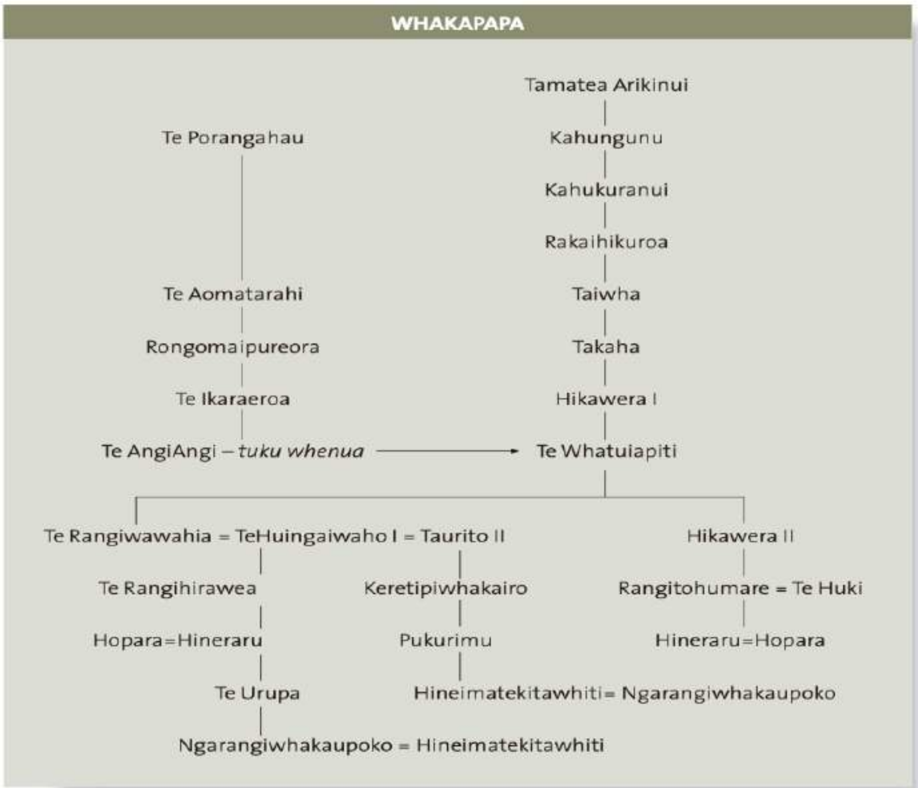
## Kere settles on the whenua

For many years the mokopuna of Te Whatuiāpiti were entangled in battle Te Rangihirawea and Te Rangikawhiua and several tipuna were killed including Kere's uncles Te Kiore and Te Rangihirawea at Te Rangitoto Pa. Hence, the older generation of Kere was gone and he was the surviving chief.
Kahutaia, the son of Manuhiri, told the young Kere to take his rightful place on the land by stating the quote.

E tama, whakatō mai i tāu pū harakeke.
Boy, plant your harakeke.

Hence, he occupied the land, he married four Hinetewai women and lived in peace.

*Ngāti Kere te hapū*
*Rongomaraeroa te marae*
*Te Poho o Kahungunu te whare.*
*Ngarangiwhakaupoko te pou*




**I a Kere te ngāhuru, ka ngāhuru noa atu**
**It is always harvest time with the ancestor Kere**

This is a whakatauākī (proverb) of local Ngāti Manuhiri Chief Te Kiekie with regards to his relative Kere (Keretipiwhakairo). When Te Kiekie looked across the coast towards Te Paerahi and saw all the fires burning along the shoreline, it was a sign of whānau occupation, cooking, and abundance of food which was the case during all seasons.

Today, the proverb is an appropriate mihi whakanui, acknowledgement of Ngāti Kere being grateful of the resources they have, not just with kai, but also the abundance of history, knowledge, and cultural resources.

## The gift of Te Angiangi to Manuhiri

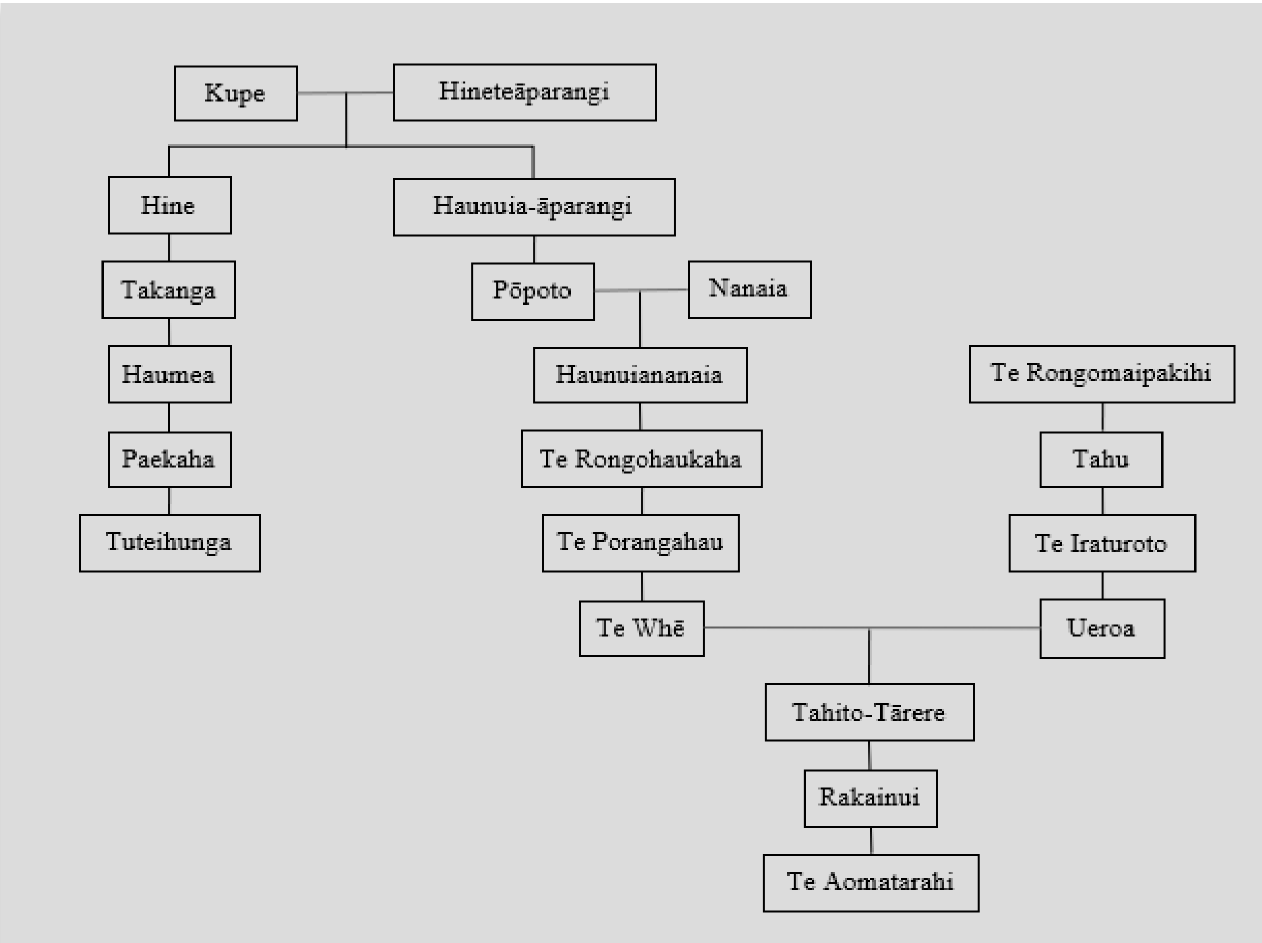
Te Angiangi gifted land to Manuhiri, and his descendants have always had rights and/or possession up until the present time. Manuhiri occupied the land during the time of Kaitahi and his people. Te Ropiha, Wi Matua and Henare Matua all have similar versions of the accounts of Manuhiri coming to Porangahau.

The following is Henare Matua's accounts of Manuhiri:

*'When Manuhiri, who was at Manawatu, heard that Te Angiangi had given land to Te Whatuiāpiti he came as far as Ngā Paeruru, leaving his women and children there... They went on their way to Te Angiangi to see if he had any spare land for them. On reaching Te Angiangi, Manuhiri told him that they have heard he was giving away his land and wanted to know if he had any for them. He said he had and gave time. Kaitahi was alive when the land was given te Manuhiri and each particular tribe kept within its boundaries.'*

## The first encounter with Europeans

Central Hawke's Bay was under the mana of Rangitane, Whātonga and hapū; Hamua, Parakiore, Tangowhiti, and Whatuiāpiti, until Ngāti Kahungunu migrated south under the chief Rakaihikuroa.
Te Aomatarahi and Taraia came as the Warrior Chiefs of Rakaihikuroa. The descendants of Taraia tended to remain in the Ahuriri-Heretaunga area, whilst the descendants of Te Aomatarahi occupied the coastal area including the Central Hawke's Bay region.



**Te Aomatarahi** = Tangowhiti

Te Ikaraeroa

Te Rongomaipureora = Hinengatira

Te Angiangi

Te Ruahikihiki

Te Tipuaiwaho

Te Rangitaurewa

**Tuanui** (Te Ranginui)

***Tuanui Te Ranginui, sketched by Hodges***

Tuanui was the first Māori of the Tamatea region to encounter the first European in October 1773. This was James Cook's second voyage to New Zealand. However, first time on the Resolution, land scape artist William Hodges, sketched Tuanui while he was on board. The descendants of Tuanui still reside in the Porangahau area today.

**Tuanui Te Ranginui** (Ngāti Hikatoa, Tumapuarangi)

Tamaiwhakahoroa = Hineiwhakarata (Ngāti Kere)

Hoani Matua

***Henare Matua***

***Heta Matua***

***Otene Matua***

***Tipene Matua***

## Mahi tahi ngā hapū o Pōrangahau by Nōpera Kuikainga

Each hapū within the wider Porangahau area resided on its own whenua but collected food from the whole area. When whales were stranded on the beach, each hapū of the community was allotted a share. When large fishing catches were made by one hapū, shares of the catch were left on the beach for others. It was the failure to observe these conventions (tikanga) which led to some of the quarrels which caused fluctuations in the membership of the community. Kere and Manuhiri lived together with Ngāi Tamatea and Tanehimoa on the land. All their descendants have continued to live on the land.

## HISTORY OF THE PORANGAHAU AREA

### 1850'S Lost opportunity and land sales

The Treaty of Waitangi is the legitimate source of constitutional government in New Zealand. It provided the British Crown with a tenuous beachhead on New Zealand soil, which has been coined as "nominal sovereignty" compared with substantive sovereignty. Māori outnumbered the Pākehā, who purported to govern them by thirty to one, and it was clear from their understanding of the Treaty that they had not conceded substantive sovereignty.[3]

The preamble in the Treaty of Waitangi legislation the transmigration of settlers from the United Kingdom. At first this one-way flow of Pākehā was acceptable to Māori because it brought increased trade and material benefits. The first fourteen years tribes, hapū and whānau in Hawke's Bay benefited through trade, flour mills, and timber mills. They had developed their own economic infrastructure. They were primary producers of agricultural produce, leasers of land, owners of wood mills and flour mills, and transporters of their own products to the markets.

### The Waipukurau block and Porangahau block sales

With settlers flooding in and clamouring for land, chiefs in Heretaunga began pushing secret land sales in Porangahau.

These purchases represent a vast change in purchasing technique from the 1851 transactions. Mc Lean invited Te Hapuku, and a party of close associates, to Wellington as guest of the Government. Mc Lean seized the opportunity presented by his good relationship with the chief and negotiated land sales in Hawkes Bay with him. The first purchase being 70,000 acres, the Tautane block, without consultation with occupants of the land.

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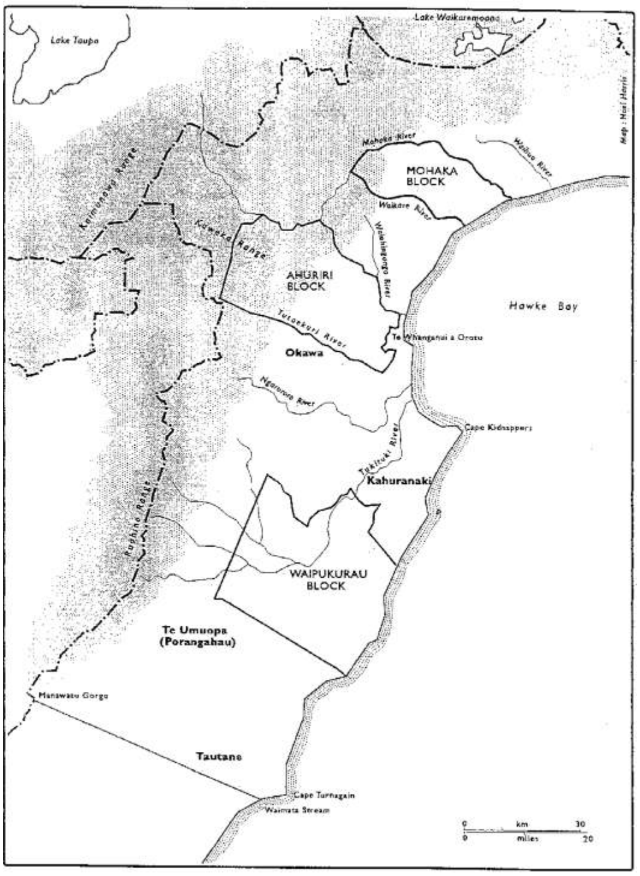
[3] Walker. Ranginui, Ka whawhai tonu mātou, Struggle without end. 1990. P98 .

*Crown Purchase Issues, 1850–62*




| Block name | Acreage | Date | Signatures | Price (£) | Reserves | |
|---|---|---|---|---|---|---|
| PorangaHau* | 145,000 | 10/3/58 | 83 | 3000 | Eparaima 1<br>Eparaima 2<br>Pakowhai<br>Makahua<br>Oerowaia<br>Manukaroa | <br><br>200<br>15<br>25<br>38 |
| Middle south Porangahau | 16,000 | 18/7/59 | 2 | 400 | Crown grants | 1300 |

* 'Return of Native Reserves', compiled by Andrew Sinclair, surveyor for the Land Purchase Department, 23 January 1862, recorded Eparaima as 1300 acres and Ahirara as 1000 acres and tabled two other reserves, Waikaraka 1400 acres and Purimu 3510 acres: AJHR, 1862, E–10, p 9.

† Sinclair records the Moeangiangi reserve with the greater acreage of 670: AJHR, 1862, E–10, p 9.

‡ Ascertaining the acreage of the parts of these reserves is fraught with difficulty; the reserves became merged with 'Northwoods Homestead', which was afforded an acreage of 11,000.

By the end of the 1850's the Crown had acquired around 800,000 acres of land in southern Hawke's Bay. Reserves (of all descriptions) were set aside for Māori from this land, totalled about 18,780 acres. By 1877 the crown had acquired 1,431,615 acres in Hawke's Bay and further substantial areas had been purchased by private parties.[4]

## 1870's land alienation and its' impact

The Native Land Act 1865 made possible the rapid individualisation of customary Māori land. This process was further refined by the Native Land Act 1873. After 1865 any individual could make an application to the Native Land Court for a title adjudication independently of the hapū or community of customary owners. This revolution in land tenure undermined community control and facilitated land alienation in Hawke's Bay on a massive scale. By 1886 only around 214,000 acres remained in customary Māori ownership. Over 900,000 acres had passed the Court between 1965-1972.

## Local bodies and councils

During the period between 1853 – 1876, Hawke's Bay was governed by a Pākehā – dominated Provincial Council which made and administered laws relating to a range of significant resources and environmental matters. Local authority settler agencies in particular were allowed to develop in ways that excluded Māori from effective participation in decision making, while these bodies were given increasing powers and responsibility for the scale and direction of habitat change.[5]

[4] AJHR, Return of Waste Lands, Showing Area Disposed of and Remaining for Future Disposal, 1877.
[5] Cathy Marr et al. Crown Laws, Policies, and Practices in Relation to flora and fauna, 1840 -1912, 2001, p 220.

From the mid to late – 19th century, the Crown assumed greater regulatory control and management of New Zealand ‘s natural resources. In many cases their control was delegated to a range of local bodies, rivers and catchment boards, drainage boards, harbour boards, acclimatisation societies, rabbit boards and county and borough councils – successors to the provincial Councils which were abolished in 1876. There is no doubt that these bodies represented settler interests and their primary aim was to promote settlement. [6]

## LAND FEATURES AND TRADITIONAL PRACTICES IN THE PORANGAHAU AREA

Ko au Te Paerahi, ko Te Paerahi ko au,
he tapu te wai, te awa, te moana, he wāhi mahinga kai, kia whai orange ai.
*I am the ocean, and the ocean is me,*
*the water, and the river is sacred, the ocean is sacred, it sustains us and gives us life.*

The Pōrangahau River runs 35 km through southern Hawke's Bay. The river winds through rugged hill country to the north of Cape Turnagain, reaching the Pacific Ocean close to the township of Pōrangahau. It has a total catchment area of 697 $km^2$. The extent of the Pōrangahau River and its catchment area can be seen in below.

The Porangahau River emerges from the northern side of the coastal ranges about 4 km directly overland from the sea and runs north for about 7 km behind and cutting through dunes until finally emerging at the sea. The coastal range lies north of the main river fan and inland of a 2 km wide belt of fan deposits and truncated and active dunes. The hill streams tend to peter out as they cross the dune country. Access up the river and to potential sources of fresh water appear to be the main factors in determining settlement distribution.

The Pōrangahau Estuary is located at the mouth of the Pōrangahau River in southern Hawke’s Bay. It is a long, narrow estuary formed behind a low, longshore bar. It has a variety of estuarine habitats including saltmarsh, intertidal sand and mudflats, and shallow tidal channels. At around 750 ha it is the largest estuary on the North Island’s east coast south of Ohiwa Harbour, dominating about 14 km of coastline. The estuary is a wildlife area of national significance. It provides roosting, feeding and breeding areas for common and rare coastal bird species including migratory waders. The estuary is also an important spawning and nursery habitat and feeding ground for native fish and is an area of great significance to Ngāti Kere and Ngāti Manuhiri. Twenty customary fishing sites exist between Pōrangahau township and the sea and the estuary continue to be an important source of pātiki (flounder) kahawai, Tuna (eels), and whitebait. The catchment is dominated by high producing exotic grassland supporting sheep and beef cattle.

[6] Alexander. David, Land -based Resources, Waterways and Environment Impacts. Crown Forestry Rental Trust Northland Research Programme, November 2006, p 33. Waitangi Tribunal.

## ❖ Mahinga Kai, Traditional Harvest

Angela Ballara, in a paper based on her thesis *The origins of Ngāti Kahungunu*, researched 18th century communities in this area. The paper notes: Pōrangahau was a fortunate community. Its people had something of everything. Near the coast the Pōrangahau River became a lagoon, rich in freshwater and saltwater species according to the tide and season. There were fishing villages associated with the community on various parts of the coast. They had much swampy ground, a source of birds, eels, and useful plants such as raupō. The river was navigable for miles inland and a network of streams criss-crossed their territory, providing an abundance of suitable locations for eel weirs. The forest inland was a source of timber for all purposes, and of other resources such as birds, native rats, berries, and wild vegetables.[7]

Ballara suggests that 18th century Hawke's Bay people were highly mobile, moving between resource areas. The resources were mostly gathered and processed where they occurred, but they may have been stored for winter in a kāinga or pā.[8]

In one month, pipi were collected, and kahawai harvested at the best locations for these resources. At another, the people moved inland perhaps to plant kūmara and other crops on some sunny northward facing slope best suited to horticulture. At other times the pigeons and berries were at their best, and they moved into temporary camps in the forest areas to exploit both. The next month might be the kelp season on the coast. The following year they would repeat the whole round of planting, gathering, harvesting and processing the different resources.[9]

Henare Matua (19th century Ngāti Kahungunu leader and politician), in evidence to the Native Land Court, gave the names of many pā and settlements around Pōrangahau. He also named various cultivations, sources of fern root, places where birds and rats were taken, karaka groves and sources of raupō. He identified nine pā tuna and indicated that there were many others shared by Ngāti Kere, Ngāti Manuhiri and Ngāti Hinetewai.[10]

Ngāti Kere and the hapū associated with Te Upoko Poua o Taua have unequivocally opposed any adverse effects or discharge into the wetlands and see the wetlands as a wāhi tapu in a cultural, spiritual, and traditional sense. Wāhi Tapu are sacred in a cultural, historical, traditional, ritual, and archaeological sense. There are several archaeological sites and sites of significance in this area.

Wetlands can be reservoirs for mātauranga (knowledge), koi-oranga (well-being), and wāhi mahi (utilisation). They are mahinga kai (food gathering sites) used by local marae, whānau, hapū, and iwi and provide significant habitats for a range of culturally important (taonga) plants, animals, fish, birds, reptiles, insects, and micro-organisms.  Wāhi repo (wetlands) are breeding grounds for native fish and tuna and a large range of culturally significant plants used for weaving – harakeke, raupō, toetoe and kuta; carving – tōtara, kahikatea; Māori materials and implements – mānuka. Many wetlands contain a variety of culturally important medicinal plants or rongoā, which are used for Māori medicinal use.

## Wetlands – wāhi tapu and sites of cultural significance.

Wetlands is a term for land areas that are saturated with water, either permanently or seasonally, such as bogs, fens, marshes, estuaries, swamps, ponds, lakes.  These are biodiversity hotspots for plants, birds and fish, many of which are endangered.  We have only 2% of our original wetlands left, so the focus is now on protecting and restoring existing wetlands, and even creating new ones. This does not have to

[7] Ballara, A. Iwi dynamics. need reference
[8] Ibid
[9] ibid
[10] Ibid

mean a loss of productive land, as often grazing is a useful management tool for keeping weeds down, which in turn helps wading birds.   Wetlands also have important roles in the environment - purifying water, flood control, carbon sink and stabilising shorelines.

Māori referred to wetlands as larders, troves of seasonal sustenance and a store of materials to fashion into whāriki (mats), taura (ropes), pātu (walls), kākahu clothes. Tohunga (healers) knew them as dispensaries of rongoā (medicines), tinctures and supplements. However, Europeans thought of them as a blight on the landscape. Wetlands had no place in the agrarian ethic they brought here — flat land was coveted; where Māori saw resources, colonists saw pasture, sheep and fences. Prosperity, progress, and many have been drained, buried and built on. 90% of our wetlands have been destroyed since European settlement. We have only 10% left – one of the worst records in the western world on a global scale.[11]

Many of the wetlands that remain are steadily degrading because there's too little water and too many weeds, pests, and nutrients. Unless we do something about these wetlands, we are just going to lose them. We're going to lose the tikanga and the resources that iwi grew up with. So, it's about helping our wetlands but also looking at it from different perspectives and trying to bring back or restore all aspects of wetlands. The cultural aspect is really important.

## TANGATA WHENUA IWI ISSUES RELATING TO MANAGEMENT OF WAI AND WĀHI TAPU

### Tumatauenga – the spiritual guardian of people and conflict

❖ **Recognition of rangatiratanga**

For many years, the Council has carried out work associated with waterways in the Porangahau area with little or no consideration of Ngāti Kere values or concerns. This has resulted in a lack of awareness and understanding of Ngāti Kere issues and values associated with water by contractors, councillors, council managers and staff.

Although the information flow between Ngāti Kere and the Council has improved, Ngāti Kere are not at the decision-making table – they have not been able to contribute to Council processes in which the priorities for river works across the rohe are discussed.  Where ideas about river management differ, Ngāti Kere are concerned that the methods employed to manage water are contrary to Ngāti Kere expectations and aspirations.

A key principle established under the Treaty of Waitangi is one of partnership between the Crown and tangata whenua – partnership implies that partners are on an equal footing. This principle applies to the CHBDC with the delegated responsibility of co-ordinating the management of natural resources such as water on behalf of the Crown.  Consultation with Ngāti Kere on matters within their mana (authority) and participation at the decision-making table is central to achieving recognition of tino rangatiratanga.

The Local Government Act 2002 recognises the Crown's obligations under the Treaty by placing specific obligations on Councils to facilitate participation by Māori in local authority decision-making processes. The Treaty of Waitangi places an additional responsibility on government to facilitate Māori participation in policy development and service delivery. In addition, the CHBDC has a responsibility under the Local Government Act 2002 to assist Māori to build their capacity to enable participation in the management of

[11] Dr Bev Clarkson, plant ecologist, Manaaki Whenua – Landcare Research.

water. This obligation is based on the premise that local government decisions will affect Ngāti Kere, so participation is important.

Māori have a unique relationship with government. The Treaty obliges government to ensure that Māori are involved in making decisions on matters that affect them. It also means that government must take positive steps to ensure that Māori interests are protected. Any compromises necessary to achieve a balance with other government obligations should be explored in good faith by the parties together.

### ❖ Ability to practice kaitiakitanga

Cultural impact assessments are a necessary and important part of environmental impact assessments – they are expressions of kaitiakitanga and provide information about how activities or management approaches impact on Ngāti Kere values associated with an area or a taonga. Council willingness to fund this report acknowledges the kaitiaki role of Ngāti Kere.

Although the development of this cultural impact assessment is a positive step toward raising awareness of Ngāti Kere values associated with wai (water), wāhi tapu and places of significance, the way in which this information is used will be the true reflection of the degree to which the Council is prepared to have particular regard to kaitiakitanga. Practical recognition of the kaitiaki (guardian) role will need to be reflected in the conditions placed on the consent and the degree to which Ngāti Kere are involved in the management of waterways and wāhi tapu in the future.

Ngāti Kere are often not part of Council process and are therefore unable to practice kaitiakitanga. This has resulted in a low level of awareness, understanding and acceptance of Ngāti Kere values by the Council and associated contractors.

In contrast to the Ngāti Kere world view, river works are focused on managing water and waterways purely for the purposes of minimising and preventing damage by floods and erosion. River works programme, which appears to be carried out independently of other Council responsibilities relating to the health of the wider catchment. Although some of the proposed activities such as pest control, bank stabilisation and riparian planting impact on the health of water, habitats and species – these wider management issues are not associated with the proposed river works. Nor is the Council's Riparian Land Management Plan, which relates directly to activities proposed under the consent. Its purpose of enhancing water quality and habitat values is not reflected in nature of the river works carried out under the consent.

Additional Ngāti Kere concerns relate to the lack of information about how waterways have changed as a result of many decades of river works. This concern extends to the cumulative effects of current and future river works carried out under the global consent, and the way in which these works will impact on the mauri of the wai in the rohe. An underlying consideration for managing rivers is the balance between controlling water and maintaining the health of indigenous ecosystems.

### ❖ Loss of wāhi tapu

Traditional occupation areas and wāhi tapu associated with wai have been destroyed or damaged as a result of urban expansion and land use. Pressure placed on the land adjacent to waterways range from reclamation of river mouths and wetland areas in order to develop roads and launching sites to earthworks associated with the construction of stop banks and river works focused on changing the flow and passage of water.

The protection of wāhi tapu is an integral role for kaitiaki. Wāhi tapu are central to Ngāti Kere identity, yet they are still at risk of being disturbed or destroyed through river works. Over time, land adjacent to waterways has been sold or alienated from tangata whenua. Subsequently, Ngāti Kere mātauranga about the location and significance of wāhi tapu has been lost. Although some work is being undertaken to record and research wāhi tapu, there are many sites or areas that have not been recorded, because the knowledge about these sites has been lost.

The Council has responsibilities under the Historic Places Act 1993, the Resource Management Act 1991, in relation to the protection of cultural heritage sites. The Council must protect all sites listed in the Council's Plan when undertaking river works, however, if sites are not accurately recorded or the buffer around a site is non-existent or too small, the chances that a wāhi tapu is disturbed or destroyed is greatly increased.

Where wāhi tapu have been damaged as a result of river works, the mātauranga associated with these places is also lost. There is always the possibility that sites may be discovered, particularly in traditional occupation areas where Ngāti Kere have collected resources for generations.

## Tangaroa – the spiritual guardian of wai

### ❖ Water quality

Maintaining and enhancing the mauri and wairua of wai is paramount to Ngāti Kere – the health and well-being of Tangaroa and all life associated with wai depend on it. A number of activities proposed under the consent have the potential to decrease water quality. Activities which result in the use machinery in waterways or sediment discharge directly impact on the life supporting capacity of wai to sustain life. The interrelated nature of wai means that a reduction in water quality impacts on all the Ngāti Kere values identified earlier in this report.

Given that Ngāti Kere view each waterway in the rohe as part of an interconnected system, particular concerns relate to activities on riparian margins and adjacent land use, and their potential to impact on water quality. An example is the management of pest species – some of which were planted by Council to stabilise riverbanks. The methods used to spray, cut, and trim pest plants are of critical interest to Ngāti Kere.

The cumulative effect of river works on water quality downstream is another area of concern. For example, the effects of river control and maintenance works on wetlands and estuaries. For Ngāti Kere, monitoring water quality is an essential practice for measuring the health of wai over time. The information gained through monitoring is necessary to guide future management practices in order to maintain and enhance waterways and associated ecosystems. The importance of placing strict controls on river works to minimise sedimentation cannot be understated.

## Haumietiketike – spiritual guardian of wild foods

### ❖ Loss of mahinga kai and rongoā species

Traditionally, flood plains in the rohe (district) were a rich source of mahinga kai. Ngāti Kere were able to harvest a large range of species. The braided rivers and wetlands were home to eels, whitebait and a great variety of indigenous fish and birds. Forests throughout the catchments linked the alpine, lowland, and coastal habitats, providing continuous cover for mahinga kai species. Changing land use and decades of river management works focused on building and maintaining stop banks and rock walls has contributed to loss of the natural character of waterways in the Porangahau area. The modification of waterways has resulted in the loss of highly productive ecosystems such as wetlands, which once supported mahinga kai and rongoā species. Introduced plant and animals compete with indigenous species for habitat and food in waterway ecosystems.

The current focus of the proposed consent on maintaining engineered structures and planting exotic species in preference to indigenous species has the effect of further reducing the remaining mahinga kai and rongoā species. For Ngāti Kere, restoring riparian margins with indigenous species and controlling introduced pests are important steps towards enhancing wai. There is a real danger that further mahinga kai and rongoā will be lost under the current approach to river works.

As plant and animal pests spread throughout catchments, this increases the adverse effects on Ngāti Kere values associated with indigenous resources, including the ability to practice customary use. Council currently relies on landowners and community groups to initiate restoration projects, undertake pest control and maintain existing indigenous habitats and species associated with waterways.

While customary species may exist in healthy numbers in some parts of the catchment, Ngāti Kere may be unable to access them. The inability to practice customary use and maintain traditions such as manaakitanga impacts directly on the cultural well-being of Ngāti Kere.

## Tane Mahuta – the spiritual guardian of forest habitat and birds

### ❖ Approach to riparian management

Ngāti Kere supports a pro-active approach to riparian management in the Flax Mill area, and favours replanting small sections of this waterway with fast growing native species suitable for the area. Any riparian planting should be carried out and integrated into other restoration projects in the rohe. Planting projects are undertaken as isolated initiatives, an approach which fails to consider wider ecosystem values. Bird corridors for example, should be considered when choosing plants to restore riverbanks or where planting will be carried out.

Ngāti Kere are concerned about the nature and timing of replacement planting. For Ngāti Kere, rehabilitation of riverbanks, lakes, and repo with indigenous vegetation is an important part of improving ecosystem health. Planting exotic rather than indigenous species is contrary to the restoration approach Ngāti Kere support as a matter of course.

The loss of shade over wai can also lead to degraded habitat for indigenous species. Bank destabilisation can occur as a result of activities proposed under the consent if replacement planting is not undertaken immediately. Another consideration is the damage to banks and vegetation caused by animals grazing along waterways – this has a direct impact on works carried out under the consent and is contrary to all Ngāti Kere values associated with wai.

### ❖ Disruption and or loss of habitat for indigenous birds and insects

The decrease in indigenous vegetation on riparian margins and adjacent land has resulted in a loss of habitats supporting indigenous birds, insects and other taonga species. The introduction of exotic plant and animal species has exacerbated the degradation of indigenous habitats. As a result, the health and well-being of many taonga species has been greatly diminished.

Restoring indigenous plant communities within catchments is a key aim for Ngāti Kere working from an integrated catchment management approach. In contrast the consent management objectives do not reflect the connections between ecosystems and indigenous species and therefore planting plans are not designed to create and extend indigenous habitats.

Another key concern relates to the proximity of Council machinery from nesting birds. River operations involving the use of heavy machinery have the potential to destroy nests and disturb nesting birds. Ngāti Kere consider the proposed mitigation measures to protect nesting birds to be inadequate. Ngāti Kere seek clarification of the scientific research these consent conditions are based on. Ngāti Kere questioned whether the Council has sufficient information about the range of indigenous birds nesting near or on waterways. This includes information on rare and endangered species associated with wai in the rohe. The current measures would not for example protect a pair of endangered birds from the adverse effects of river works 50 metres from their nest.

- **Protecting what is left.**

Local Hapū are concerned about the damming, drainage, and pollution of waterways because of their effects on the mauri of the waterways. The adverse effects of nutrient enrichment from farm run-off and leaching, storm discharges and pollution from industrial point sources are identified as problems.

In addition, land drainage, adjacent landfills, animal grazing and exotic plants have degraded many surviving wetland areas. Much of the remaining wetland is on private land and Māori may not have access to these places.

Freshwater habitats in Hawke's Bay include rivers and streams, wetlands, lakes and lagoons. Historically rare ecosystems associated with freshwater environments are braided riverbeds, lake margins, cushion bogs, and ephemeral wetlands (i.e., wet only at certain times). People can enjoy recreation when there is healthy freshwater. However, challenges to freshwater ecosystems are algae such as phormidium and didymo, aquatic weeds like hydrilla, sediment and pollution, and low summer flows.

Ngāti Kere see the protection and enhancement of Te Upoko Poua o Taua and the existing wetlands as vital, particularly in terms of protection from inappropriate use and damage.

## TOWARDS A PARTNERSHIP BETWEEN NGĀTI KERE AND COUNCIL

The recommendations have been written in the spirit of partnership – with a view towards Ngāti Kere involvement in making decisions on matters that affect wai, wāhi tapu and places of significance. This approach acknowledges the Council's legal obligation to take positive steps to ensure that Ngāti Kere interests are protected.

It also recognises that if Ngāti Kere and Council work together, this can result in many benefits including:

- A greater understanding of each other's expectations and aspirations.
- Increased opportunities to work on joint projects.
- Improved processes based on a greater understanding of each other's priorities, expectations and resources.
- More efficient use of resources; and
- Promoting the cultural well-being of Māori

Ngāti Kere understand that compromises may be necessary to achieve a balance with other government obligations, but that options need to be explored in good faith by the Council and iwi together.

## Executive Summary

The Central Hawkes Bay District Council is proposing to upgrade the Pōrangahau and Te Paerahi Wastewater Treatment Plant (PTPWWT) at Pōrangahau to allow for an improved land based disposal of treated effluent project, which will include an irrigation system and merging the two ponds to one complex.

Iwi Consultation with the Ngāti Kere iwi authority Te mana o Ngāti Kere.

The Ngāti Kere iwi authority/ Te mana o Ngāti Kere are the only mandated group to represent Ngā Hapu of Pōrangahau. Te mana o Ngāti Kere has been contracted by CHBDC to provide a Cultural Impact Assessment (CIA) for this Project. Te Tore o Puanga is the RMA unit of the Authority who will develop this CIA. It is intended that the information shared in this CIA will be used to inform the planning design and mitigation of cultural impacts of the Project.

Engagement with hapū and whānau in this project required a well-defined structure that ensured that shared goals around water quality was attained, and a clear system of reasoning was provided that enabled the RMA to be given effect to.
A well-designed engagement plan would have identified the correct hapū to engage with, where immediate priorities should have been as follows.

Ahi kā Roa, Mana Whenua, Tangata Whenua – those hapū who currently have active marae on the land, and whom therefore are immediately affected by decisions made.

**Rongomaraeroa Marae** is the only active Marae in Pōrangahau and CHBDC initially did not come to the Marae but met at the local Hotel. The Trustees Chair Anthony Tipene -Matua, encouraged the Council and the consultants to come to the Marae with good robust proposals.

RMA Part 1 – Section 2(1) Interpretation and application
The RMA lays out procedures designed to ensure a fair process. The resource manual "Making good decisions -The guidelines for RMA decision makers" identifies in Schedule 1: Reference in the RMA to Māori terms and concepts Part 1- Interpretation and application – 2(1)
"Tangata Whenua, in relation to a particular area, means the iwi, or hapu that hold mana whenua over that area."

The site of the proposed wastewater treatment application is on a cultural landscape opposite to Pukepuketauhinu peninsula and west to Taurekaitai river.

As an integral part of the resource consenting process prior to lodging their Archaeological Authority (AA) application, CHDC consulted with the landowners, hapū, and various community representatives. The consent pre-lodgement consultation and outcomes of that consultation will be ongoing and summarised in the separate Consultation Summary which covers the period up to June 2021. Since lodgement of the resource consent applications, consultation and dialogue have continued to occur between CHDC and relevant parties, particularly Ngāti Kere.

The public notification processing of the resource consent applications will result in more submissions from individual groups, but the Ngāti Kere Authority/ Te Mana o Ngāti Kere is the only mandated authority in Porangahau, endorsed at a public hui and endorsed by
**Te Kāhui Kaumatua.**

Assessment Methodology and Report Framework

In preparing this report Ngāti Kere Kaumatua and representatives of the Ngāti Kere Authority:

1. Visited the site for the proposed work with C.H.D.C and consultants of the Project

2. Checked for known registered archaeological sites on the New Zealand Archaeological Association "Arch Site" and reviewed the Archaeological report provided by Dr Elizabeth Pishief for the Central Hawkes Bay District Council.

3. Checked Maori land online to identify any known Maori Land to be affected,

4. Checked Ngāti Kere Historical Resources in regard to the area,

5. Undertaken to expedite the report in the tight timeframe available,

6. The Central Hawkes Bay District Council and consultants of the Project have provided their various reports in electronic format, so these have been viewed from Ngāti Kere.

7. Ngāti Kere Kaumatua and representatives of the Ngāti Kere Authority, whānau and CHDC including the Mayor Alex Walker, went on a site visit to the Horowhenua Plants.

Project Consents Applied for Central Hawkes Bay District Council.

A. Land Use Consent for large scale earthworks (3 years): large scale land disturbance associated with upgrading and the additional storage to the existing Pōrangahau Wastewater Treatment Plant, including trenching for the installation of irrigation reticulation.

B. Discharge Permit to treat and store wastewater and the associated discharge of treated wastewater to land which may enter water (35years): discharge treated wastewater from the floor and walls of the Porangahau Te Paerahi Wastewater Treatment Plant oxidation and storage ponds.

C. Discharge Permit to discharge treated wastewater to land which may enter water: discharge of treated wastewater from the Foxton Wastewater Treatment Plant onto and into land by irrigation.

E. Land Use Consent for an intensive farming activity (unlimited): the irrigation of wastewater to land such that the use of the land is an intensive farming unit as defined under the One Plan.

Te Awakari ā Tamanui: Porangahau Oxidation Pond.

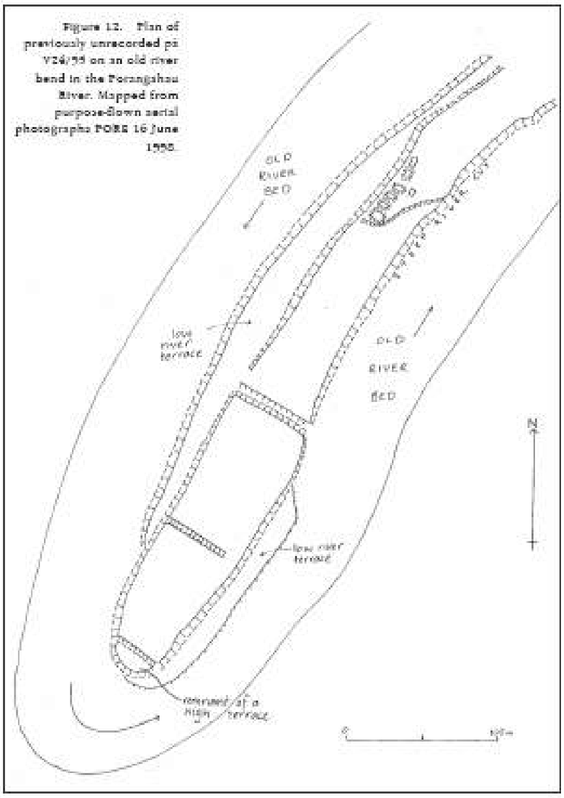


Figure 12. Plan of previously unrecorded pā V24/55 on an old river bend in the Porangahau River. Mapped from purpose-flown aerial photographs PORE 16 June 1998.

**Location:** Cooks Tooth Road

**Rural Town:** Porangahau

**Region:** Central Hawkes Bay

**Legal Description:** Secs 49 & 73 Blk XII Porangahau SD (CT HB 171/40) Hawkes Bay Land District

**GPS Coordinates:**

Te Awakari – e*trex* (4 m error margin**)**

Northing 6093200 Easting 2817200 (northern point

Northing 6093458 Easting 2817433 (Pits )

Northing 6093139 Easting 2817278 (river end).

Te Awakari pā is located on a 500m long point in an abandoned meander on the south side of the Porangahau River which used to flow past the site as late as the 1960s. The pā site consists of transverse ditches and on the down-river aspect of the site, it comprises of a low level terrace that sits 2 metres below the rest of the site. At the northern end of the pā site there are a group of 7 pits.

**General nature of the Wāhi Tapu**
Te Awakari or Te Awakari a Tamanui is a Pātuwatawata and urupā.

**Statement of values (traditional, spiritual, ritual, mythological, traditional)**
Te Awakari is wāhi tapu in the traditional and spiritual sense.
The values associated with Te Awakari a Tamanui Pā include:

Urupā – burial site
Awakari drainage systems and defence ditches
Waka tapu – sacred waka

The Pātuwatawata known as Te Awakari, was last occupied in the late 1840s by the descendants of the ancestor Kere and was considered by many to be the last occupied palisade pā in the Porangahau area. Much of the archaeological evidence associated with this pā has been destroyed by floods and extensive pastoral farming. What remains however, demonstrates an interesting past and evidence suggest that there was extensive cultivation by Māori around the local rivers and streams. Te Awakari pā is located near the Tauri-kai-tai River in Porangahau. This pā is also known as Te Awakari a Tamanui. In 1887 at a Native Land Court hearing, Henare Matua, a local kaumatua, described how some of the original habitants of the region, including Tamanui of Ngāti Kere, developed an elaborate drainage system to save the gardens from constant flooding.
The drain surface trenches are still evident today and the local hapū consider these drainage systems as a symbol of traditional resourcefulness. [1]

Te Awakari is also the burial site of Roka Te Korohu, one of the chiefs that remained on the land during the 1820s exodus to Nukutaurua.[2] This exodus was a result of inter-tribal warfare of the surrounding Heretaunga plains.

Ngāti Kere is one of the hapū associated with the extended tribes, Rangitane and Ngāti Kahungunu. In the early 1800s, much of the region occupied by these two iwi, Kahungunu and Te Whatuiapiti, was abandoned because of the constant fighting in the area.

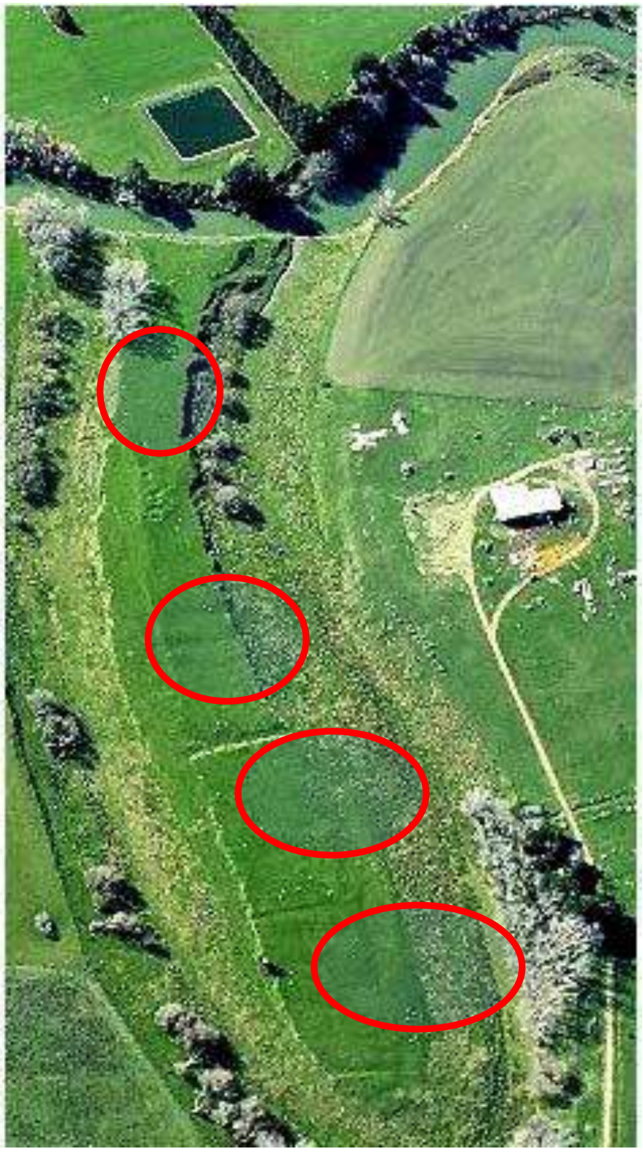
The catalyst for these unprecedented changes was a series of raids on Heretaunga and Ahuriri by musket-armed war parties from the north. A number of Ngai Whatuiapiti people went onto Nukutaurua at Mahia where they could make an attack on any outsiders who attempted to occupy Heretaunga.

Many of the pā in the Porangahau region were deserted during this period except for Te Awakari. Ngāti Kere and other hapū gathered and occupied Te Awakari in preparation for the invading war parties.

In 1887, Wi Matua gave evidence at a Native land court hearing describing how his father, Roka Te Korohu, was one of the chiefs that remained at Te Awakari pā to witness Ngāti Kere return to Porangahau in 1843 after living in exile for more than 15 years. He also recounts a celebration held at Te Awakari for the return of hapū to their whenua.

The principal chiefs of Porangahau at that time were Aperahama Te Whakaanga, Ropiha Te Takou and Hoani Matua.

In the early 1900s, a waka-tētē associated with Te Awakari pā was hauled out of Te Taure-Kai-Tai River and was considered to be a Taniwha associated with many of the deaths that had occurred during that time. A local kaumatua declared the waka to be tapu and allied with mākutu or spells and never to be lifted. The waka has never been moved to date. Ngāti Kere consider Te Awakari or Te Awakari a Tamanui tapu in the spiritual and traditional sense.



In the 1970's the river cutting was put in place this compromised the site and the whitebait spawning area.

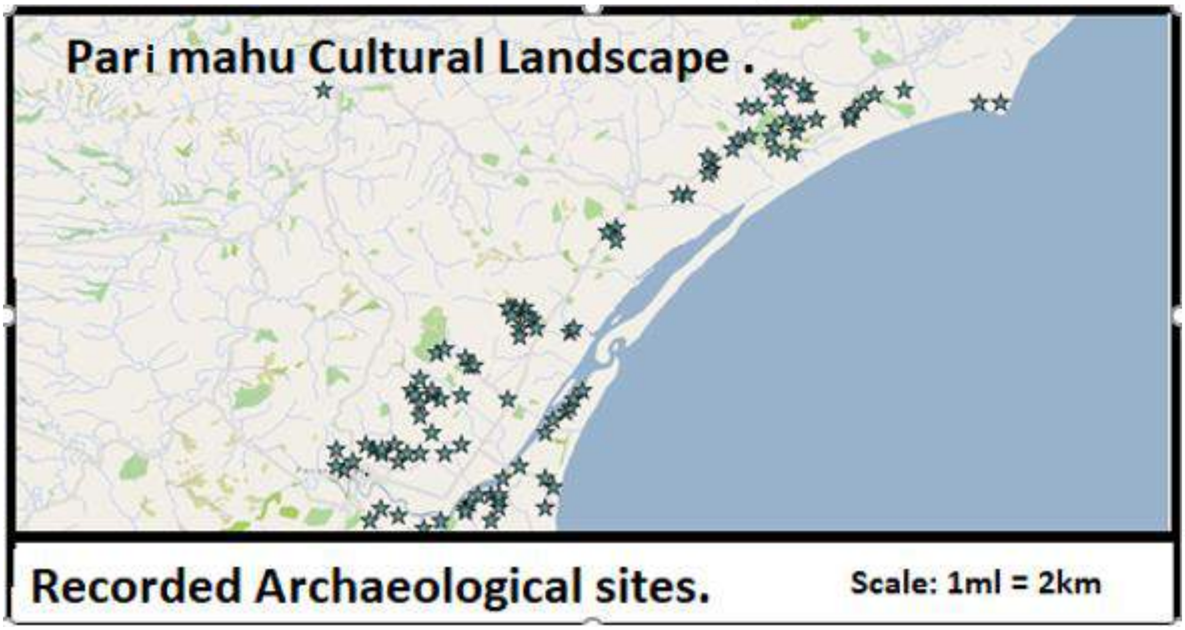
Recommendation:

Any future work on this site will require Ngati Kere input and iwi representation with future works.

1 Matua, H. (1887), *Hastings Maori Land Court Minute Book* - Includes evidence of Henare Matua (Ngati Kere) at a hearing at Waipawa concerning the Porangahau Block. A copy of this minute book is held by the Tipene-Matua whanau, Pouwhakarae Trust.

2 Ibid .Page 4 of 16 NZHPT REGISTER OF HISTORIC PLACES, HISTORIC AREAS, WĀHI TAPU AND WĀHI TAPU AREAS

## 7. MAJOR BIBLIOGRAPHIC REFERENCES

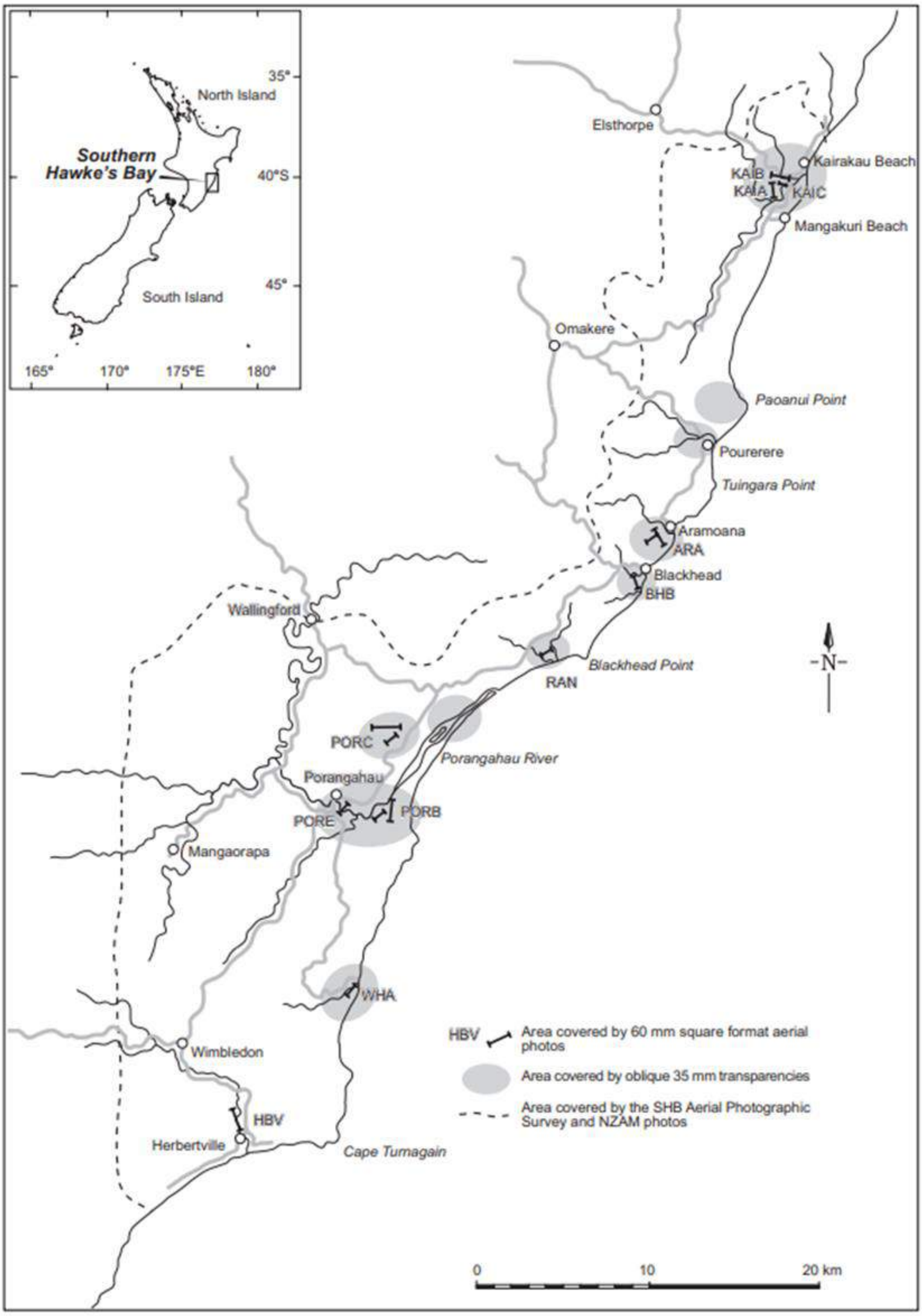


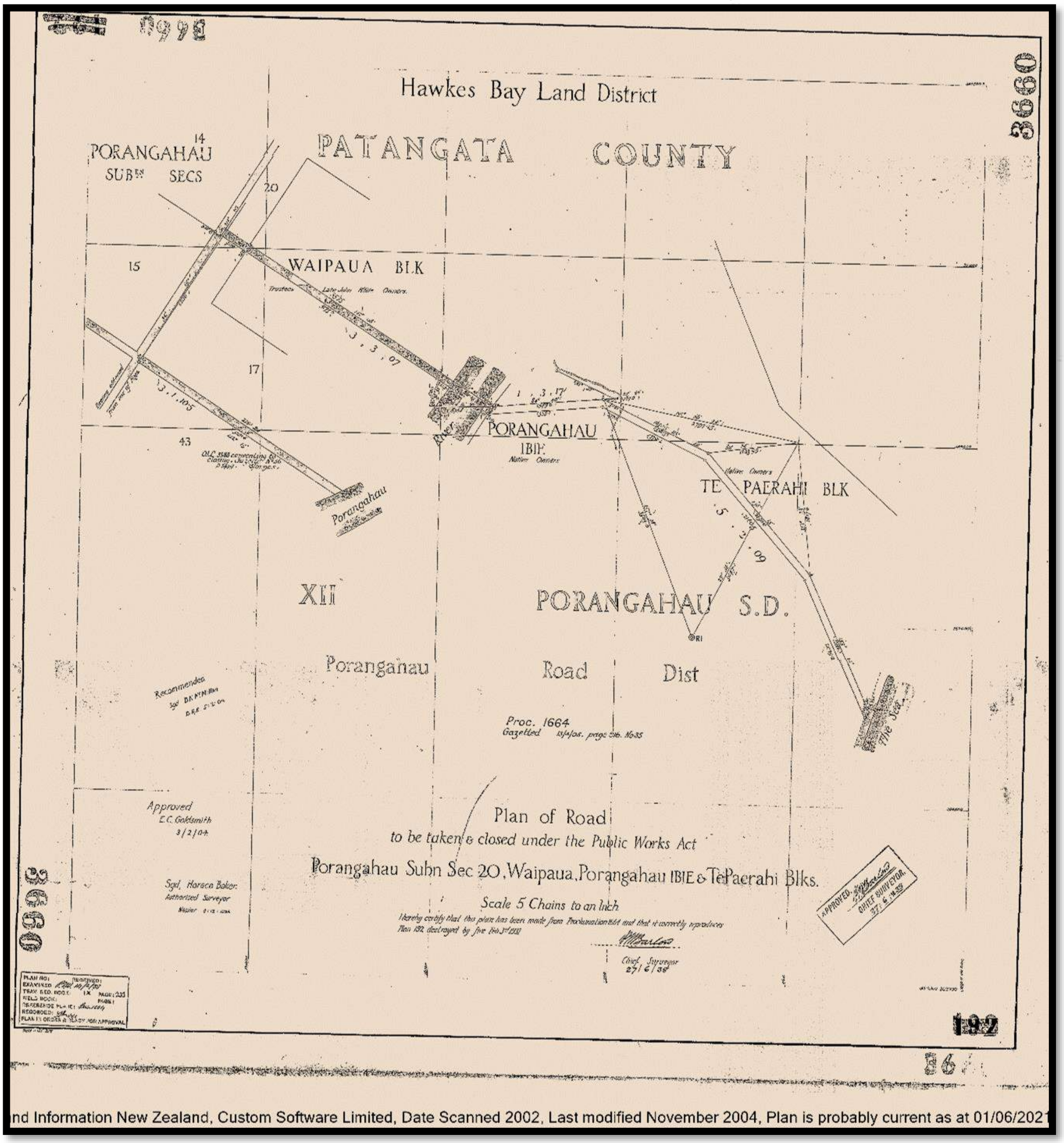

## Archaeological site recording scheme, Porangahau Coast.

Archaeological sites attest to a long history of Māori settlement in the Pōrangahau, Te Paerahi Central Hawkes Bay area. It is a rich cultural heritage landscape with a wide range of ancestral Māori sites.

There are numerous recorded archaeological sites of interest to Māori have been identified within the immediate works footprint. Given the ancestral Māori cultural footprint and settlement pattern of the area, there is reasonable cause to suspect further un-recorded archaeological evidence and features of Māori origin, may be uncovered during the proposed works. The effects of proposed works on the Māori values of recorded and un-recorded ancestral sites depends on the nature of any proposed works and the degree to which they will be impacted upon. All recorded and un- recorded archaeological sites (and associated traditional and cultural evidence) have significant Māori values to Kaitiaki Māori as they represent the ancestral footprints of Ngā Tūpuna.

Archaeological sites attest to a long history of Māori settlement in the Pōrangahau, Te Paerahi, Puketauhinuhinu Peninsula area. It is a rich cultural heritage landscape with a wide range of ancestral Māori sites. Given the ancestral Māori cultural footprint and settlement pattern of the area, there is reasonable cause to suspect further un-recorded archaeological evidence and features of Māori origin, may be uncovered during the proposed works. The effects of proposed works on the Māori values of recorded and un-recorded ancestral sites depends on the nature of any proposed works and the degree to which they will be impacted upon. All recorded and un-recorded archaeological sites (and associated traditional and cultural evidence) have significant Māori values to Ngāti Kere and Ngāti Manuhiri (Kaitiaki Māori) as they represent the ancestral footprints of Ngā Tūpuna.


North Island
35°
Southern Hawke's Bay
40°S
45°
South Island
165°
170°
175°E
180°
Elsthorpe
Kairakau Beach
KAIB
KAIA
KAIC
Mangakuri Beach
Omakere
Paoanui Point
Pourerere
Tuingara Point
Aramoana
ARA
Blackhead
BHB
Wallingford
Blackhead Point
RAN
N
PORC
Porangahau River
Porangahau
PORE
PORB
Mangaorapa
WHA
HBV
Area covered by 60 mm square format aerial photos
Area covered by oblique 35 mm transparencies
Area covered by the SHB Aerial Photographic Survey and NZAM photos
Wimbledon
HBV
Herbertville
Cape Turnagain
0
10
20 km




Māori Reserve acquired under the Public Works Act.

Several archaeological surveys have been undertaken in the Porangahau area with including a survey by Nigel Prickett from Auckland Museum in 1990 who recorded many middens in the immediate vicinity, although none on the land in question. Kevin Jones from the Department of Conservation in Wellington, with the assistance of Vanessa Tanner, undertook an aerial survey of the Southern Hawke's Bay Coast in 1997, which resulted in numerous sites being recorded, although there were none identified on the land in question.[12]

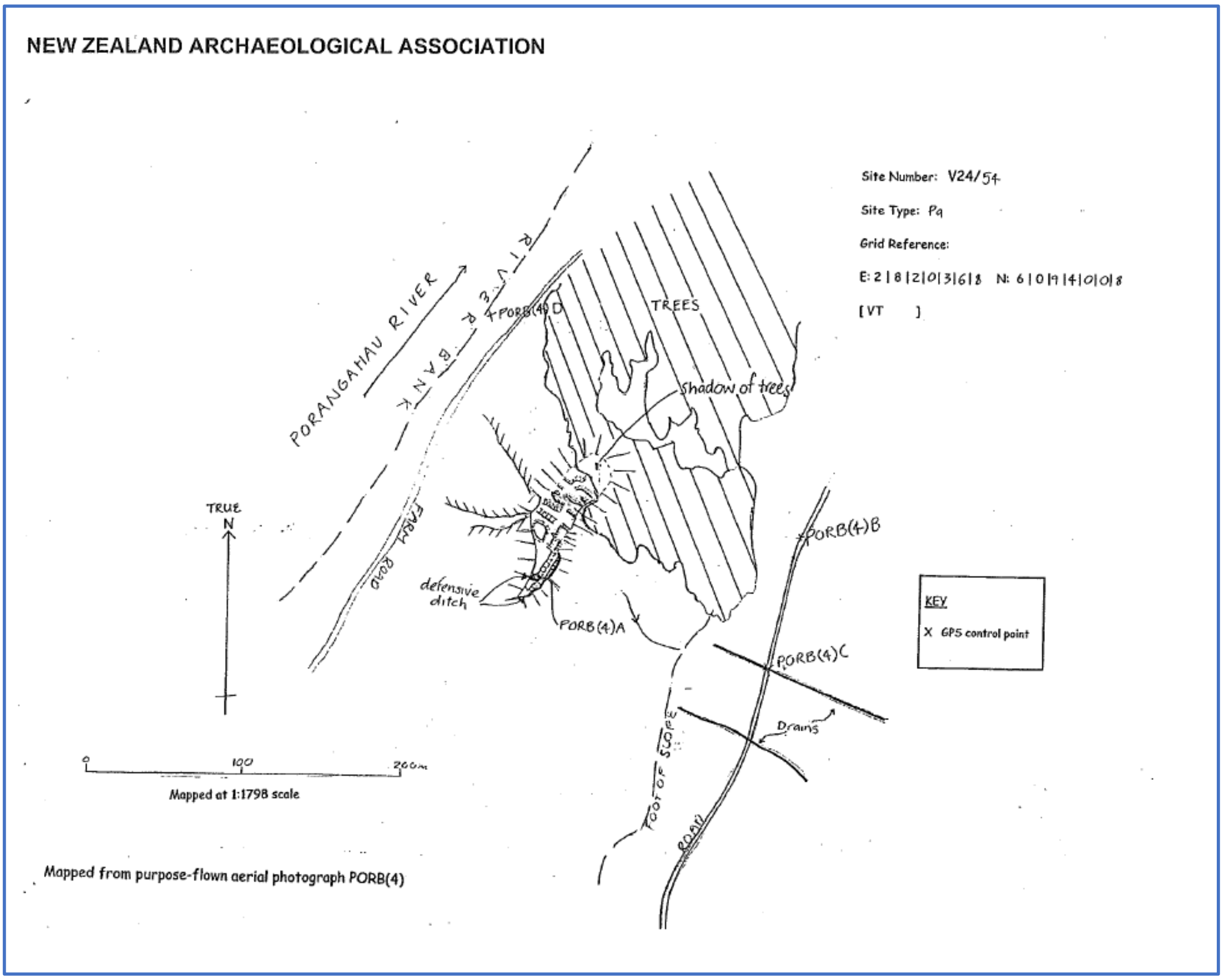
[12] Pichef.E Archaeological Assessment of Effects : Porangahau and Te Paerahi Wastewater Upgrade, 2021.

## Oreorewaia, Te Ariki Awatea

| | |
|---|---|
| Ko Oreorewaia te pātuwata. | Oreorewaia is the pa. |
| Ko Te Ariki Awatea te whare. | Te Ariki Awatea is the house. |
| Ko Kahutaia te rangatira. | Kahutaia is the rangatira. |
| Ko Ngāti Manuhiri te iwi. | The people belong to Manuhiri. |

Oreore = move, quiver, shake
waia = to be accustomed to, familiar with, used to, practised.

Oreorewaia is a defensive Pā site NZAA recorded site record V24/54, Pa the site is located on the southern side of the Porangahau River across the bridge closest to the coast on Beach Road. (NZAA records have not been ground truthed).



NEW ZEALAND ARCHAEOLOGICAL ASSOCIATION

Site Number: V24/80

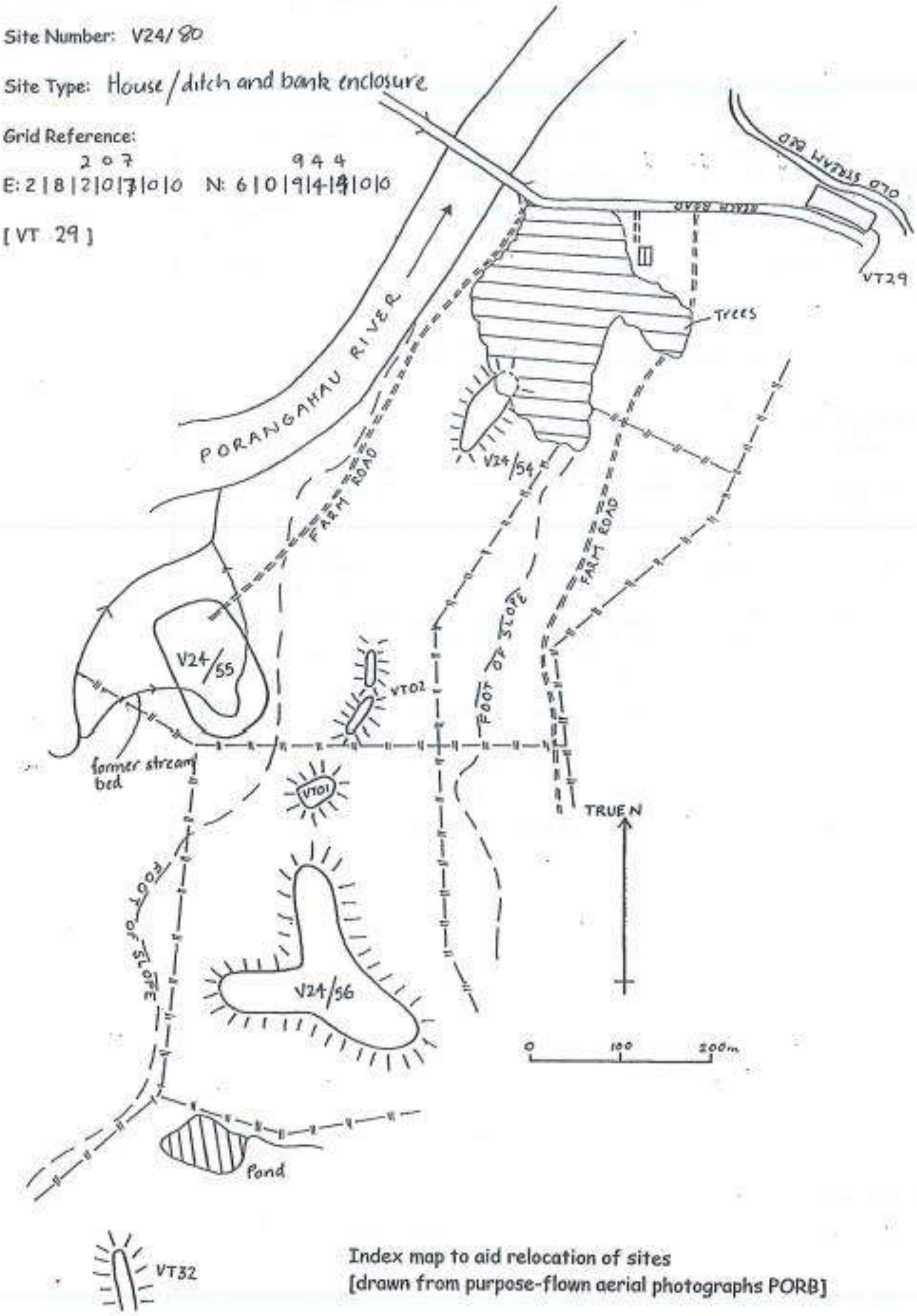
Site Type: House / ditch and bank enclosure

Grid Reference:

E: 2 | 8 | 2 | 0 | 7 | 0 | 0  N: 6 | 0 | 9 | 4 | 4 | 0 | 0

2 0 7  9 4 4

[VT 29]




Index map to aid relocation of sites
[drawn from purpose-flown aerial photographs PORB]

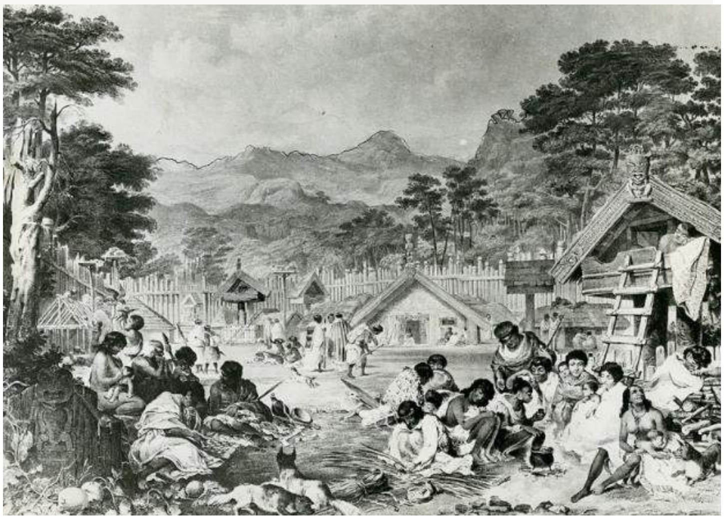
Artefacts from sand dune paddock collected by Gordon Stoddart. Source: E Pishief 13 January 2021.

## Stone tools

When the ancestors of the Māori first arrived in New Zealand from East Polynesia, around 1250 to 1300 AD, they found a wide variety of rock types suitable for making tools, ornaments and other items. They were familiar with some materials like basalt and chert (or flint) but not with others, such as pounamu (New Zealand jade, greenstone – nephrite or bowenite). Within perhaps 50–100 years the main sources of suitable stone were known, and several major centres of stone-tool manufacture were established. In the 1300s, Māori were transporting both finished tools and selected raw materials around the country.

### Adzes and chisels

The most important tools were adzes (toki) and chisels (whao). Stone adze heads were lashed to a wooden handle and used in working wood, including canoe building. Chisels were primarily used for finer carving.



Initially, many types of adzes were made, in styles similar to those found on eastern Pacific islands. The early adzes had a well-defined butt or grip for lashing to a handle. The majority were made from basalt or other hard rock, notably:

- adzite, a very tough, fine-grained metamorphic rock, also called baked argillite
- greywacke, which is hard sandstone.

Adzite and nephrite are found only in the South Island, yet adzes made from these materials have been found throughout New Zealand, indicating extensive trade.

Oreorewaia Kainga, Oreorewaia pā.

At various times the people of Porangahau built and occupied at least 19 pā, Oreorewaia is one of these pā. Some of these were occupied by single hapū; others were shared by two hapū or used in common. In addition to pā, the main hapū of the community occupied together at different times 12 kāinga or undefended settlements. Most had only one or two houses, and were associated with specific seasonal economic activities and resources. In addition to places termed 'kāinga' or 'settlements', two 'camping places', and seven fishing spots were named.[13]

Nine pā tuna (eel weirs) were named and evidence given that there were 'many other eel weirs besides then shared by Ngāti Kere, Ngāti Manuhiri and Ngāti Hinetewai. After giving the names of many pā and settlements Hēnare Matua said that cultivations used by these were 'all about the same places'. He gave the names of five of them. He also named various sources of fern root, places where birds and rats were taken, karaka groves and sources of raupō. Mangamaire was a place many canoes were made by Ngāti Kere and Ngāti Manuhiri; Kere's son Te Ahurangi had given the order for their construction. Orākai-ō-roa was a place for making nets. [14]

[13] Ballara.Angella. Porangahau Biography . The Dictionary of New Zealand Biography, Wellington Pg 17 . Henare Matua, evidence.
[14] Ibid pp17-18

## RECOMMENDATIONS

The report identifies key issues resulting from the activity based on information to date, and sets out recommendations for the protection of cultural taonga.

The intention is that the CIA process would facilitate mana whenua understanding of the effects of the proposal on their relationship with the area to a point where the applicant can consider how those effects might be avoided, remedied or mitigated.

The CIA has described the reasons for the involvement of Ngāti Kere and Ngāti Manuhiri, recounting the traditional and historical cultural connections and taonga of the site which includes the Pa, wahi tapu, papakainga, Taurekaitai River, Streams, and the wider environs.

1. **General recommendations**

   The long term consent plans include the connection of the Marae to this system as compensate for the 40 years use of Māori land for free. (Puketauhinu) and on hapū wāhi tapu (Te Awakari a Tamanui).

2. Taurekaitai river is sacred to Ngāti Kere, Ngāti Manuhiri in the traditional sense, mahinga kai (whitebait spawning area, patiki, kahawai, Tuna, Moki) and ritual sense, tohi, whakanoa and all strategies should be taken to protect this taonga.

3. Improvements in water quality and a net gain in mahinga kai values, consistent with the long term vision of mana whenua to protect and restore the cultural health of the Taurekaitai River.

4. Effective and robust working relationships between Ngāti Kere and Ngāti Manuhiri throughout the development and ongoing operation of the site. Tikanga be adhered to throughout all projects. e.g. Karakia.

5. Any consent plans should include Ngāti Kere, Ngāti Manuhiri cultural monitors.

6. That an equivalent area be set aside for wetland or native bush construction. If it assists the Council, it may be agreeable in part to Ngāti Kere if some of the area is planted in native plants rather than grazing pasture.

7. Native plantings to consider as a possible avenue to assist mitigation. Planting and fencing to create or protect whitebait spawning habitat around the site would be viewed as positive and may even assist in protecting the river from flooding.

8. Any artefacts recovered and samples taken will be analysed and recorded by the appropriate specialists.

9. All future monitoring of the river will include iwi representation and any opportunities for our young to learn and train.

10. Any Maori artefacts will be notified to the Ministry for Culture and Heritage in accordance with the Protected Objects Act 1975. But these taonga will be held by a registered collector of Ngāti Kere.

10. The Project Archaeologist will provide a report to Heritage NZ within 20 days of the completion of archaeological work. This may be the final report if no or limited archaeological remains are found.

11. If more extensive remains requiring detailed analysis are found, the Project Archaeologist will complete a full monitoring report within 12 months of the end of the archaeological work, and will provide it to Heritage NZ and other parties identified in the Authority.

12. Maori artefacts such as carvings, stone adzes, and greenstone objects are considered to be taonga (treasures). These are taonga tuturu within the meaning of the Protected Objects Act 1975. Taonga may be discovered in isolated contexts but are generally found within archaeological sites. If taonga are discovered the following protocols will be adopted and tangata whenua, will decide on custodianship of the taonga.

13. The area containing the taonga will be secured in a way that protects the taonga as far as possible from further damage, consistent with conditions of the Authority. The Archaeologist will then inform Heritage NZ and the Iwi representatives so that the appropriate actions (from cultural and archaeological perspectives) can be determined. If required these actions will be carried out within the stand down period specified below, and work may resume at the end of this period or when advised by Heritage NZ or the Archaeologist.

## Ngāti Kere & Council working together

The recommendations have been written in the spirit of partnership – with a view towards Ngāti Kere involvement in making decisions on matters that wāhi tapu, wāhi noho, wāhi tupuna, and places of significance.
These recommendations recognise that if Ngāti Kere and CHBDC work together, this can result in many benefits including:

- A greater understanding of each other's expectations and aspirations.
- Increased opportunities to work on joint projects.
- Improved processes based on a greater understanding of each other's priorities, expectations and resources.
- More efficient use of resources; and
- Promoting the cultural well-being of Māori

i. Ngāti Kere understand that compromises may be necessary to achieve a balance with other obligations,

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CENTRAL HAWKE'S BAY DISTRICT COUNCIL

# APPENDIX M

## Pōrangahau and Te Paerahi Community Wastewater – Discharge Conceptual Design (LEI, 2021:P:C.15)

# Porangahau and Te Paerahi Community Wastewater

# Discharge Conceptual Design

**(LEI, 2021:P:C.15)**

Prepared for

**Central Hawke's Bay District Council**

Prepared by

Lowe Environmental Impact

August 2021

# Porangahau and Te Paerahi Community Wastewater – Discharge Conceptual Design

## (LEI, 2021:P:C.15)

## Central Hawke's Bay District Council

This report has been prepared for the **Central Hawke's Bay District Council** by Lowe Environmental Impact (LEI). No liability is accepted by this company or any employee or sub-consultant of this company with respect to its use by any other parties.

| Quality Assurance Statement | | |
|---|---|---|
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| Prepared by: | Sam Morris, Katie Beecroft | |
| Reviewed by: | Hamish Lowe | |
| Approved for Issue by: | Hamish Lowe | H J Lowe |
| Status: | Final | |

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Ref: PC.15-RE-10684-CHBDC-Conceptual_Design.docx

Job No.: 10684

Date: August 2021

## TABLE OF CONTENTS

# 1 EXECUTIVE SUMMARY

Central Hawke's Bay District Council (CHBDC) are responsible for the management of wastewater from the communities of Porangahau and Te Paerahi. Wastewater for Porangahau is currently collected and conveyed to an oxidation pond treatment system located at the end of Jones Street, Porangahau. Treated wastewater is then discharged to a drain entering the Porangahau River. For Te Paerahi, wastewater is collected and conveyed to an oxidation pond treatment system located off Te Paerahi Road. The treated wastewater from Te Paerahi is discharged to culturally significant coastal sand dunes via sub-surface soakage.

Following engagement with key stakeholder groups, a strong direction to develop a land based application regime for a long term solution was given and Best Practicable Option developed (BPO; LEI, 2021:P:C.12). This report describes the design concept for a staged development of a new wastewater discharge for the communities, which includes discharge to land for agronomic benefit and discharge to a non-deficit irrigation system to manage seasonal high flows of wastewater.

An extensive process including technical reporting and community consultations has been undertaken to identify:

- The available options for a long term discharge;
- Following identification of land discharge as the preferred option, a location for discharge; and
- A suitable discharge regime on the identified land.

The discharge system described reflects the reasonable and appropriate balance between the social, cultural, environmental and economic considerations.

A detailed discussion of the existing treatment systems, and how the wastewater design parameters were determined, is set out in the Beca report (Beca, 2020:P:C.10). The discharge environment has been evaluated to determine key design objectives such as:

- Porangahau River water quality and values (Beca, 2021:P:B.24a); and
- The ability of the soil and plant system to assimilate water and nutrients from wastewater (LEI, 2020:P:B.15).

The development of the discharge system for Porangahau and Te Paerahi's wastewater is proposed to be staged. Land to be used is located on the corner of Beach and Hunter Roads. The proposed system allows for a rapid reduction in the amount of treated wastewater discharged via the existing systems to their respective environments, whilst managing the costs to the Council and the time for procurement and construction to occur.

The staging involves a number of tasks and changes, including reticulation, treatment, storage and discharge. A summary of the proposed stages as they relate specifically to the discharges and new treatment and storage is as follows:

- **Stage 0** allows for the current discharge for both communities to their respective receiving environments to occur for up to four years at Te Paerahi and six years at Porangahau from consent granting while the subsequent stages are enacted;

- **Stage 1** involves provision of 500 $m^3$ of storage within the Te Paerahi WWTP and development of a minimum 4 ha on the Discharge Property, allowing irrigation to sandy soils (IMU 3) under typical irrigation conditions for approximately 43 % of the **current** Te

Paerahi average annual wastewater discharge volume and 57 % of the annual volume under a non-deficit wet soils regime. This stage **only** includes Te Paerahi flows and applies all to the Discharge Property, while the existing river discharge for Porangahau will continue.

The discharge regime assumes that the currently occurring wastewater flows occur (no allowance for future growth), up to 500 m$^3$ of storage is available at the Te Paerahi WWTP and discharge under a non-deficit wet soils regime can occur when soils cannot receive wastewater under typical irrigation conditions;

- **Stage 2** involves development of an additional 6 ha of irrigation for sandy soils (IMU 3), allowing for a minimum 10 ha of irrigation at Stage 2. Stage 2 allows for irrigation to IMU 3 (wet and regular irrigation regimes) of between 61 % to 100 % of the **future (2028)** Porangahau and Te Paerahi annual wastewater discharge volumes. This stage includes **both** Porangahau and Te Paerahi flows, but allows for between 0 % to 39 % of all flows to continue to the Porangahau River (when storage is not possible and soil conditions are too wet).

  Stage 2 sees the inclusion of two sub-stages (2a and 2b) which allows assessment of the worst case scenario to occur i.e. 100 % to land or as much to land as practically possible and the balance to the river. In practice for Stage 2, a system which is predominantly to land but includes some contingency discharge to the river is likely.

- **Stage 3** involves development of an additional 10 ha of irrigation for sandy soils (IMU 3) and incorporation of 20 ha of silty/clay soils (IMU 1), allowing for a minimum 40 ha of irrigation at Stage 3. A new combined WWTP and storage pond is to be built at the land application site to receive Porangahau and Te Paerahi flows with a capacity of (up to) 35,000 m$^3$. This storage allows for irrigation of between 66 % and 100 % of the **future (2057)** average annual wastewater discharge volume to the regular irrigation system (typical irrigation) and between 0 % to 36 % to be applied under a non-deficit wet soil regime.

The management characteristics used for the conceptual design are summarised in Table 1.1.

**Table 1.1: Discharge and Management Summary**

| Parameter | Current Stage 0 | Stage 1 (TP) | Stage 2a (P+TP) | Stage 2b (P+TP) | Stage 3a (P+TP) | Stage 3b (P+TP) |
|---|---|---|---|---|---|---|
| Storage volume (m$^3$) | ~1,000 | ~500 | ~1,000 | ~1,000 | ~10,900 | ~35,500 |
| Average annual outflow from WWTPs (m$^3$) | ~76,600 | ~24,600 (~76,600) | ~102,000 | | ~183,000 | |
| **Discharge to Porangahau River and Te Paerahi Coast** | | | | | | |
| Volume per year (m$^3$) | ~52,000 | ~52,000 | - | ~53,000 | 0 | 0 |
| N mass loading from wastewater (kg/y) | 1,532 | 1,076 | 0 | 1,050 | 0 | 0 |
| P mass loading from wastewater (kg/y) | 383 | 269 | 0 | 260 | 0 | 0 |
| **Deficit/Non-Deficit Irrigation – Regular Irrigation (Dry Soils)** | | | | | | |
| Irrigation regime | Nil | Deficit | Deferred, non-deficit | | | |
| Landform | Nil | Coastal sand dunes | | | Coastal sand dunes and alluvial plains | |
| Total area – including non-irrigated (ha) | 114.3 | | | | | |

| Parameter | Current Stage 0 | Stage 1 (TP) | Stage 2a (P+TP) | Stage 2b (P+TP) | Stage 3a (P+TP) | Stage 3b (P+TP) |
|---|---|---|---|---|---|---|
| Wastewater irrigated area (ha) | - | 4 | 10 | 10 | 40 | 40 |
| Irrigation event application (mm/event) | - | Up to 20 | Up to 20 | Up to 20 | Up to 20 | Up to 20 |
| Average annual irrigation volume ($m^3$/y) | - | ~10,000 | ~31,000 | ~32,000 | ~121,000 | ~187,000 |
| Average annual application depth (mm) | - | 255 | 307 | 370 | 305 | 468 |
| Wastewater Nitrogen load (kg N/ha/y) | - | 51 | 61 | 63 | 61 | 91 |
| Wastewater Phosphorus load (kg P/ha/y) | - | 13 | 15 | 16 | 15 | 23 |
| **Non-Deficit Irrigation – Wet Soils** | | | | | | |
| Maximum application rate per event ($m^3$) | - | 20 | 20 | 20 | 20 | 20 |
| Volume per year ($m^3$) | - | ~14,000 | ~71,000 | ~17,000 | ~66,300 | ~0 |
| Average annual application depth (mm) | - | 350 | 710 | 170 | 663 | 0 |
| Wastewater Nitrogen load (kg N/ha/y) | - | 70 | 142 | 34 | 133 | 0 |
| Wastewater Phosphorus load (kg P/ha/y) | - | 18 | 35 | 8 | 33 | 0 |
| **Sand Dunes (LMU 3/IMU 3)** | | | | | | |
| Farm Management current/proposed | Pastoral grazing, rotational cropping | | | | | |
| Vegetation current/proposed | Cocksfoot & marram grasses, winter oats | | | | Cocksfoot & marram grasses | |
| **Alluvial Plains (LMU 1 & 2/IMU 1)** | | | | | | |
| Farm Management current/proposed | Low intensity pastoral grazing/ rotational cropping | | | | | |
| Vegetation current/proposed | Ryegrass pasture; crops (e.g. chicory, raphno, oats, turnips) | | | | | |

In summary, the discharge system is proposed to consist of the following components:

- 500 $m^3$ of storage, potentially as freeboard, at the Te Paerahi WWTP for Stage 1. Construction of a pipeline from Te Paerahi to the application site;
- 1,000 $m^3$ of storage between the Porangahau and Te Paerahi WWTPs for Stage 2. Construction of a pipeline from Porangahau to the application site;
- Construction of a new WWTP servicing Porangahau and Te Paerahi and an (up to) 35,000 $m^3$ storage pond for Stage 3.
- Irrigation pump station located at discharge Site built for Stage 1;
- A series of fixed and moveable impact sprinklers; and
- Wet well and pumping to:
    - 4 ha at Stage 1;
    - 6 ha (minimum) additional area at Stage 2; and
    - 30 ha (minimum) additional area at Stage 3.

# 2 INTRODUCTION

## 2.1 Purpose

This report describes the design concept for a staged development of a new combined wastewater discharge for the Porangahau and Te Paerahi communities which includes discharge to land for agronomic benefit and discharge to a non-deficit irrigation system to manage seasonal wastewater flow highs and wet soils. This report describes the design regime which is the most reasonable and appropriate system after an evaluation of alternatives. This report provides information to support the consenting process, specifically details of the proposed activity and information to support the land and water assessments of environmental effects (LEI, 2021:P:D.10 and Beca, 2021:P:D.25).

## 2.2 Background

Central Hawke's Bay District Council (CHBDC) are responsible for the management of wastewater from the communities of Porangahau and Te Paerahi. Wastewater for Porangahau is currently collected and conveyed to an oxidation pond treatment system located at the end of Jones Street, Porangahau. Treated wastewater is then discharged to a drain entering the Porangahau River. For Te Paerahi, wastewater is collected and conveyed to an oxidation pond treatment system located off Te Paerahi Road. The treated wastewater from Te Paerahi is discharged to culturally significant coastal sand dunes via sub-surface soakage.

## 2.3 Scope

This Conceptual Design report contains the following information:

- Section 3 describes the development of the discharge concept;
- Section 4 characterises the wastewater to be discharged;
- Section 5 outlines the key receiving environment properties to be addressed by the system design;
- Section 6 explains the management considerations for the irrigated area;
- Section 7 describes the proposed discharge regime and key inputs and outputs from the system;
- Section 8 summarises the conceptual design and outlines the next step in the design and consenting process for the long term discharge of Porangahau and Te Paerahi treated wastewater;
- Section 9 outlines construction works required; and
- Section 10 presents a summary and conclusions.

This report describes the system concept of the Project. It does not address the potential environmental effects of the Project, except where the design has been informed by a need to avoid or mitigate potential adverse environmental effects.

Data used to determine the discharge regime are as received. It has been assumed that data supplied to LEI is correct and representative. Criteria and parameters adopted in this report are conservative and there may be scope for refinement at the detailed design stage. Detailed design is not able to be completed until resource consents are decided.

# 3 DEVELOPMENT OF THE CONCEPT

## 3.1 Existing Reporting

A programme of information gathering, consultation, data processing and evaluation, and scenario development precedes the conceptual design. A range of source material has been used in the development of the discharge conceptual design. Information specific to the Site and relied upon for this report are included within this wider consent package.

Information in the reports included within this consent package are not repeated in full in this report. It is recommended that the reader consults the reports referenced for further information in the first instance.

## 3.2 Design Aim

The intention of the design concept is to develop a reasonable and appropriate discharge regime which considers and incorporates the social, cultural, environmental and economic needs of the communities. The system needs to be able to be sustainably operated for the foreseeable future, both in terms of the treatment of wastewater, and in terms of ensuring that the integrity of the land and surface water is not compromised by long term, repeated application of wastewater.

## 3.3 System Concept

The discharge of wastewater could continue to be to surface water (for Porangahau) as it has been historically, or to land, as is increasingly being adopted for small communities. The key drivers to move to a land based discharge system are tangata whenua aspirations, community wellbeing (public health and social acceptability), and potential environmental improvements, in particular to waterway health. The design of a land discharge system is typically based around achieving measurable beneficial environmental outcomes, for instance, a reduction in nitrogen levels in receiving water. Having a quantifiable parameter assists design since changes can be predicted and measured.

### 3.3.1 Drivers for Change

Beca (2020:P:B.24a) state that total nitrogen, total phosphorus, and dissolved reactive phosphorus concentrations are all above relevant ANZECC guidelines upstream of the discharge point. The discharge is believed to currently be causing minor increases in nutrient and microbiological contaminant concentrations, however no formation of excessive plant, algae and slime growths are noted relative to upstream (Beca, 2020:P:B.24a). During low flow conditions, the discharge is expected to cause moderate increases in nutrient and faecal coliform concentrations in exceedance of relevant guidelines (Beca, 2020:P:B.24a). It is acknowledged that the existing discharge contributes to an overall nutrient and contaminant load to the Porangahau River and the community deems this unacceptable.

For the Te Paerahi WWTP, environmental effects of the existing discharge to coastal dunes are expected to be negligible (Beca, 2021:P:D.60). Very low levels of pathogens are noticed within surrounding groundwater monitoring bores with negligible effects anticipated for the marine environment and risk to shellfish gathering (Beca, 2021:P:D.60). Furthermore, residual contaminants in groundwater are highly unlikely to enter surface freshwater or migrate towards the public drinking water supply bore (Beca, 2021:P:D.60). Being discharged to culturally significant dunes, continuation of this existing discharge is not acceptable to the community and must cease, with the preferred receiving environment being to land (LEI, 2021:P:C.12).

This means that decisions around the future discharge of Porangahau and Te Paerahi's wastewater are driven by both water quality factors, as well as factors not easily quantified, being in many cases non-tangible iwi and community preferences.

### 3.3.1 Identification of the Concept

In developing the conceptual design CHBDC has considered the social, cultural, environmental and economic wellbeing of the district. Engagement and consultation has been undertaken to determine what values the stakeholders, which include community members, iwi representatives, special interest groups and statutory partners, have for the management of the wastewater in the district. This includes dedicated consultation with the Porangahau and Te Paerahi communities and tangata whenua. Details of the consultation are given in the Consultation Summary (LEI, 2021:P:C.34).

During the consultation process new ideas were proposed, some issues were agreed upon and others were unable to be resolved to all parties' agreement. Where possible, points raised through the process have been incorporated into the key design decisions (LEI, 2021:P:C.12). Key design decisions determined through the investigation and consultation process relate to:

1. Options for the discharge;
2. Location of the discharge;
3. Wastewater treatment options; and
4. Location of a new combined WWTP servicing both communities;

An attempt has been made in the development of this conceptual design to develop a reasonable and appropriate balance between the social, cultural, environmental and economic considerations.

In the absence of a quantifiable surface water improvement target (as Porangahau's existing discharge effects cannot be measured), the conceptual design has been based on the ability for land to accept the wastewater. The design has also aimed to address the Porangahau and Te Paerahi communities desire to see ideally 100 % of the discharge being applied to land.

LEI (2021:P:C.12) outlines the process behind the nomination of a land discharge regime as being the best practicable option to receive Porangahau and Te Paerahi's wastewater. A Consultation Summary (LEI, 2021:P:C.34) is appended to this report outlining the community consultation between CHBDC and relevant stakeholders as part of both the existing resource consents, as well as the proposed land discharge regime.

## 3.4 Tangata Whenua Concerns

Issues for consideration with regard to cultural concerns are being identified and described in a Cultural Impact Assessment (CIA) which is being prepared (Tipene-Matua, 2021:P:D.50 – final not available at the time of writing this report). This CIA report will add to the collective knowledge surrounding the Maori world view on wastewater management, which is described in How (2020:A:B.42).

While commissioned and not yet available at the time of writing this report, specific issues raised in the CIA will be addressed in any subsequent iterations and refinements to the system design.

## 3.5 Summary of Concept Development

An extensive process that has included technical reporting and community consultation has been undertaken to identify:

- The available options for a long term discharge;
- Following identification of land discharge as the preferred option, a location for discharge; and
- A suitable discharge regime.

The discharge system described in Section 7 in this report reflects the reasonable and appropriate balance between the social, cultural, environmental and economic considerations.

# 4 DISCHARGE CHARACTERISTICS

## 4.1 General

A detailed discussion of the current treatment systems, and how the wastewater design parameters were determined for the respective communities, is set out in the Beca report (Beca, 2020:P:C.10). This section lists the key wastewater parameters adopted for the conceptual design and describes how these have influenced the design.

## 4.2 Wastewater Flows

A reliable flow data set was available for the Porangahau and Te Paerahi WWTPs for the period 01/01/2008-30/11/2019. This data was evaluated, along with predicted changes to wastewater flows in future due to population growth, infiltration and stormwater inflow works and trade waste discharges (Beca, 2021:P.C.16). Population projections indicate a significant increase in population for the Porangahau township with Te Paerahi populated expected to remain constant until 2057 (Beca, 2021: P:C.16). A ten year flow data set was generated based on actual recorded flows and flow predictions for each of the project stages (equivalent outflow at 2019, 2028 and 2057) to account for year-on-year variability in the wastewater flow data.

A summary of flows adopted for 2019, 2028 (late in Stage 2) and 2057 (end of consent term) for Porangahau is given in Table 4.1.

**Table 4.1: Daily Outflow Record for Porangahau (2019-2057)**

| Flow | 2019 | 2028 | 2057 |
|---|---|---|---|
| Median Flow ($m^3/d$) | 94 | 155 | 374 |
| Average Daily Flow ($m^3/d$) | 141 | 205 | 437 |
| 99%ile Flow ($m^3/d$) | 849 | 953 | 1,330 |
| Maximum Flow ($m^3/d$) | 2,250 | 2,354 | 2,731 |
| Average Annual Flow ($m^3$) | 51,500 | 75,000 | 160,000 |

Table 4.2 shows the projected inflows from the Te Paerahi settlement. Beca (2021:P:C.16) does not project an increase in wastewater flows over the consent term. It is noted that the reported 2019 average daily flow (ADF) is 130 $m^3/d$ compared to the measured ADF from the available data record which is around 67 $m^3/d$. Wastewater flow data used for the development of a discharge regime is from the measured daily outflow record.

Te Paerahi is a beach settlement with seasonal variation in population corresponds to peak occupancy in summer. A peaking factor of 2 has been adopted (Beca, 2021:P:C.16) to represent the summer peak wastewater flows. This peaking factor is low for a holiday destination but reflects the existing record for Te Paerahi.

**Table 4.2: Daily Inflow Record for Te Paerahi (after Beca, 2021:P:C.16)**

| Flow | Average Inflow (Current - 2019) | Average Inflow (Future - 2057) | Peak Season Inflow (Current - 2019) | Peak Season Inflow (Future - 2057) |
|---|---|---|---|---|
| Average Dry Flow per capita (l/p/d) | 144 | 144 | 144 | 144 |
| Dry Weather Flow (ADWF) ($m^3/d$) | 45 | 45 | 90 | 90 |
| Average Daily Flow (ADF) ($m^3/d$) ** | 130 | 99 | 260 | 197*** |

* Beca, 2021: P:C.16 does not predict that Te Paerahi flows will increase over the term of the consent.
** Beca, 2021: P:C.16 bases Te Paerahi ADF on an inflow and infiltration factor of 2.7 currently and 2.2 in the future (20% reduction in inflow and infiltration).
*** Beca, 2021: P:C.16 states that, this is less than 260 because it is assumed that I&I to existing reticulation will be reduced.

Based on the existing flow record, Figure 4.1 shows the distribution of flows through an average year for both communities and includes projected 2057 flows.

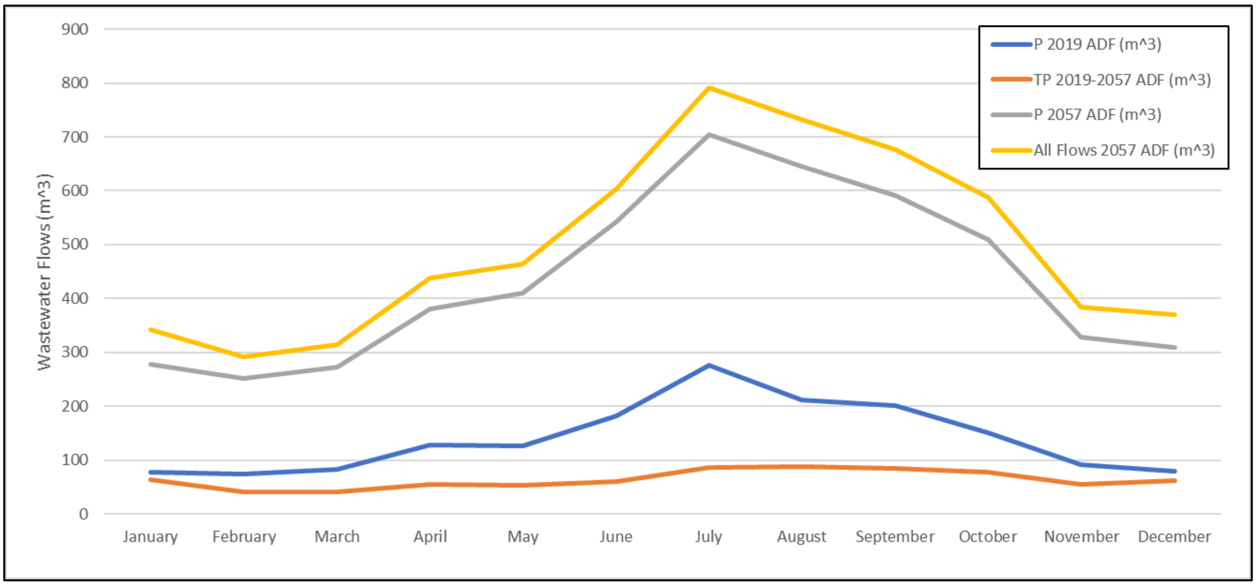



**Figure 4.1: Average daily wastewater flows per month for Porangahau/Te Paerahi**

Wastewater outflow rates have been used for the determination of the discharge to the irrigated land since these represent the flows that require discharge on any day.

## 4.3 Wastewater Quality

A detailed analysis of wastewater influent quality and treated wastewater quality for the respective WWTPs is given in the Beca report (Beca, 2020:P:C.10, Sections 3.1 and 4.1 for Te Paerahi, and Sections 3.2 and 4.1 for Porangahau). The performance and suitability of the existing treatment plants to continue to be used until the development of Stage 3 is provided in the treatment plant performance summary (Beca, 2020:P:C.10, Section 3.1 for Te Paerahi and Section 3.2 for Porangahau). This report highlights that no improvements are needed in the performance of the existing wastewater treatment plants if irrigation is to be used. However, it would be of benefit for the irrigation management to incorporate fine filtration (to avoid sprinkler blockage) and disinfection using UV (health and safety) of flows for irrigation.

Constituents of the treated wastewater to be irrigated that are considered in the conceptual design are predominantly due to potential environmental or public health risk. Key parameters taken fortnightly from the oxidation ponds are summarised in Table 4.3 for Porangahau and Table 4.4 for Te Paerahi.

**Table 4.3: Treated Wastewater Parameters at Porangahau WWTP Oxidation Pond (November 2009-April 2021)**

| | Units | n | Min | 5%ile | Median | Mean | 95%ile | Max |
|---|---|---|---|---|---|---|---|---|
| pH | | 298 | 7.1 | 7.4 | 7.8 | 7.88 | 8.6 | 9.2 |
| *E.coli* | cfu/100ml | 138 | 4 | 97 | 2,700 | 2244* | 72,750 | 220,000 |
| Enterococci | cfu/100ml | 139 | 4 | 39.8 | 660 | 808* | 17,240 | 191,000 |
| Total P | g/m$^3$ | 139 | 0.92 | 1.01 | 1.97 | 2.14 | 3.75 | 4.05 |
| DRP | g/m$^3$ | 139 | 0.28 | 0.62 | 1.31 | 1.45 | 2.5 | 3.83 |
| Total N | g/m$^3$ | 138 | 6.7 | 7.53 | 13 | 13.68 | 20.62 | 27.6 |
| TKN | g/m$^3$ | 139 | 0.01 | 0.05 | 12.1 | 11.75 | 20.03 | 27.6 |
| Total Ammoniacal N | g/m$^3$ | 139 | 0.24 | 2.1 | 7.3 | 7.86 | 14.7 | 19.6 |
| Suspended Solids | g/m$^3$ | 298 | 1.5 | 3 | 29 | 34.2 | 92 | 126 |
| $cBOD_5$ | g/m$^3$ | 298 | 1.5 | 3 | 17 | 17.89 | 39.15 | 58 |
| Dissolved Oxygen | ppm | 296 | 0.2 | 0.45 | 2.56 | 3.77 | 10.52 | 21.7 |

**E.coli* and *Enterococci* mean concentrations are presented as geomeans.

**Table 4.4: Treated Wastewater Parameters at Te Paerahi WWTP Oxidation Pond (November 2009-February 2021)**

| | Units | n | Min | 5%ile | Median | Mean | 95%ile | Max |
|---|---|---|---|---|---|---|---|---|
| pH | | 294 | 7.1 | 7.5 | 7.9 | 7.9 | 8.4 | 9 |
| Faecal Coliforms | cfu/100ml | 272 | 120 | 2,000 | 27,150 | 24,462* | 221,400 | $8 \times 10^6$ |
| Total Ammoniacal N | g/m$^3$ | 95 | 0.005 | 0.1 | 6.3 | 10.7 | 35.3 | 54.2 |
| Suspended Solids | g/m$^3$ | 294 | 3 | 8 | 40.5 | 49.5 | 115.1 | 163 |
| $cBOD_5$ | g/m$^3$ | 294 | 1.5 | 3 | 13 | 14.9 | 30.4 | 113 |
| Dissolved Oxygen | ppm | 293 | 0.12 | 0.2 | 3.7 | 4.2 | 9.8 | 13.9 |

*Faecal Coliforms mean concentrations are presented as geomeans.
**No nitrogen or phosphorus based parameters outside of Total Ammoniacal N have been measured for Te Paerahi.

This wastewater quality has been assumed for Stage 0, 1 and 2. Following the establishment of a new WWTP at Stage 3, the wastewater quality has been assumed to achieve an **average quality** not exceeding:

- 20 g O/m$^3$ carbonaceous biochemical oxygen demand;
- 30 g/m$^3$ total suspended solids;
- 20 g/m$^3$ total nitrogen;
- 5 g/m$^3$ total phosphorus;
- 500 MPN/100 mL *E.coli* (following UV disinfection).

Additional detail regarding future wastewater treatment and performance is given in Beca (2021:P:C.16).

## 4.4 Provision of Storage

To assist with managing the development and operation of a land application system the provision of storage is recommended. Use of storage assists to avoid the need for a direct surface water discharge and to enable a greater volume of water to be beneficially used (i.e. irrigated when plants can best utilise it).

Section 7.2 below gives a summary of the project staging. This is based on an increase in storage capacity between Stages 0-2 and Stage 3. The storage requirements are as follows.

- **Stages 0-2 – Utilisation of existing 500 m$^3$ storage within each of the respective treatment plants:** Approximately 1,000 m$^3$ of storage is available in the existing treatment plants (500 m$^3$ in each) up until the development of Stage 3. Sufficient treatment capacity will be retained in the ponds. Following development of a new storage pond at Stage 3, this extra volume will be lost with the decommissioning of the two WWTPs and made available in the new WWTP constructed at the discharge site.

- **Stage 3 – New storage:** An additional (up to a maximum of) 35,000 m$^3$ of storage is proposed to be provided in a new pond and WWTP at the commencement of Stage 3. CHBDC intend to purchase land at the discharge site for the construction of a pond. The preferred location is given in Figure 4.2. A final site and design of the pond and WWTP is subject to a landform assessment and geotechnical investigations.

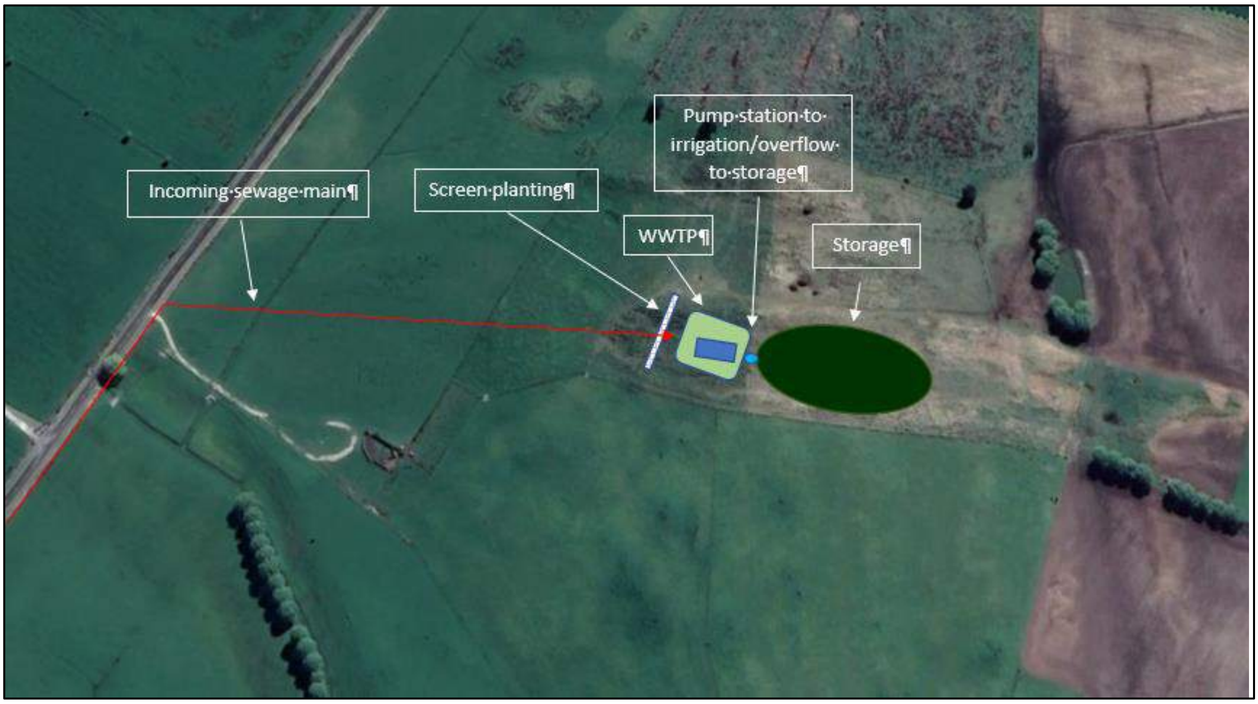



**Figure 4.2: Potential Storage Pond and WWTP Location (Beca, 2021:P:C.16)**

# 5 DISCHARGE ENVIRONMENT

## 5.1 General

At Stage 1 all treated wastewater from Te Paerahi will be discharged to land and all treated wastewater from Porangahau will continue to be discharged to the Porangahau River at the current discharge point. At Stage 2 treated wastewater from Te Paerahi and Porangahau will be discharged to land with some discharge of Porangahau treated wastewater to the current river discharge continuing. At Stage 3 all wastewater from the two communities will be conveyed to a collective treatment facility and discharged to land or stored for later discharge to land.

Section 5 summarises the discharge environment parameters which inform the discharge regime concept. A series of reports details these environments. These reports are included in this consent package and are referenced below.

## 5.2 Land Environment

Porangahau and its WWTP are located on the alluvial plains of the Porangahau River in the Central Hawke's Bay District. This alluvial plain surrounds the Porangahau River as it emerges from the tertiary to cretaceous aged mudstone and sandstone hill country west of the township and flows east then north-east to the Pacific Ocean, 8 km north-east of Porangahau (GNS, 2021). Shallow groundwater and fine grained soils are noted on this surface.

Te Paerahi, its WWTP and the existing discharge field are located on Holocene aged, windblown sand dune and estuarine deposits, surrounded to the south by Late Cretaceous to Paleogene aged mudstones (GNS, 2021).

Land between the settlements is dominated by the alluvial plain with overlying dunes near to the coast on both sides of the Porangahau River estuary. Evidence of historic movement and occupancy is present all along the coastal dune land form.

The area identified for land application is located over both the Porangahau River alluvial plain and wind-blown coastal sand dunes adjacent to the river. The discharge regime needs to take into account the differing management requirements of the finer grained alluvial soils and sandy dune soils.

Investigations have noted that there are a number of small water paths which drain the hills towards the river and several of these, some as formed drains, run through the target area. At the base of these water ways gravel is noted and it is expected that the fine grained alluvial material overlays river and beach gravels.

Soil hydraulic characteristics and soil chemistry were determined from site investigation (LEI, 2020:P:B.15). This information will assist in combining land areas that are subjected to similar management, which are further described in Section 6.6.

## 5.3 Surface Water Environment

Available information about the surface water environment has been presented and evaluated in the reports:

- Porangahau Wastewater Treatment Plant Discharge Water Quality Assessment (Beca, 2021:P:B.24a).

Beca (2021:P:B.24a) notes that:

- *Water quality monitoring carried out by Central Hawkes Bay District Council (CHBDC) upstream of the discharge point demonstrate that the Pōrangahau River has generally elevated nutrient concentrations. Water quality parameters with medians above ANZECC physical and chemical (PC) stressor values for warm, dry low-elevation rivers include total phosphorus, dissolved reactive phosphorus, and total nitrogen.*

And that:

- *based on historical monitoring, the discharge does not appear to result in the formation of excessive plant, algae and slime growths in the Pōrangahau River relative to upstream. For faecal coliforms, it is noted that recreational activities occur some distance downstream at the Bridge Rd bridge and that further dilution will occur between the point of discharge and these downstream recreational areas.*

In order to model the river discharge a gauging site with a lengthy and continuous flow record was needed. Beca (2021:P:B.24a) notes that *"flow in the Pōrangahau River is subject to extremes. Very low flows are recorded in summer, with flows of less than 0.1 $m^3$/s common. The section of the Pōrangahau River around the WWTP discharge is strongly influenced by the tides with a measured difference between high and low tide of approximately 0.5 m. This tidal influence is stronger during late summer when the contributing flows from the river catchment can decrease below 100 L/s. The tidal interchange of water in this section of the river is therefore more significant in the context of the wastewater discharge than the base river flow. The river is considered typically saline at the point of discharge under background, low flow conditions."*

## 5.4 Estuarine Environment

Available information about the coastal and estuarine environment of the Porangahau River has been presented and evaluated in Beca (2021:P:D.65).

## 5.5 Summary

Table 5.1 below summarises the main constraints identified in previous reports.

**Table 5.1: Key Constraints for Irrigation**

| Subject | Constraint | Design Solution | Reference |
|---|---|---|---|
| Land assimilative capacity | Free draining nature of the high central sand dunes indicates that nutrient loading is likely to a limiting factor for these dunes. | Apply a limit for irrigation based on an agronomic requirement. Assess discharge to non-deficit system as if no nutrient attenuation occurs. | LEI (2020:P:B.15)<br>Section 7 (LEI, 2021:P:C.15) |
| Land prioritisation | Available land is predominantly Zoned as A (alluvial plain NE), B (central sand dunes) and D (alluvial plain S) indicating that there are limitations in places for land discharge of wastewater needing to be managed. | Irrigation design optimised to obtain maximum benefit from the wastewater with minimum adverse effects to the land and surface water. | LEI (2020:P:B.11) |
| Soil description | Soil hydraulic conductivity indicates that water depth of application will be limiting on the soils overlying the alluvial | Apply instantaneous and discharge event limits that are based on measure soil unsaturated hydraulic conductivity. | LEI (2020:P:B.15)<br>Section 7 (LEI, 2021:P:C.15) |

| Subject | Constraint | Design Solution | Reference |
|---|---|---|---|
| | plain due to their poorer draining nature. | | |
| Flood hazard | The alluvial plain to the south is classified as being a flood risk area with the higher sand dunes and alluvial plain to the north-east being low risk to flooding in a 1 in 100 year flood event by HBRC. | Ability to use non-deficit irrigation on land on the higher elevated sand dunes | LEI (2020:P:B.11) |
| Existing environmental conditions | The existing discharges have not caused any significant adverse effects to their receiving environments. The proposed environment is well suited to land application. | Discharge to land will enable beneficial use of wastewater. | Beca (2020:P:B.24a)<br><br>Beca (2021:P:D.60) |
| Tangata whenua considerations | To be determined based on forthcoming CIA. | - | - |
| Archaeology | Multiple sites of significance have been located across the Site to date and an unknown number may still be located during the construction phase. | An archaeologist will be on Site during the construction phase and appropriate protocol will be in place for the discharge system. | Pishief (2021:P:B.18) |
| Landscape and natural character | Farming and irrigation (moveable pods and fixed sprinklers) are the predominant landscape features near the Site. | Land management will be in keeping with the surrounding area. Moveable pods and fixed sprinklers are proposed which fits with the visual amenity of the area. | LEI (2021:P:C.14a)<br><br>Section 7 (LEI, 2021:P:C.15) |
| Ecology | The Porangahau River and estuary typically contain great ecological habitat value which should be maintained. The terrestrial habitat is predominantly occupied by farming activities. Riparian margins (adjacent to the Porangahau River may have additional habitat values. | Minimise discharge to the non-deficit system where possible. Retain farming and cropping, and maintain riparian planting along the Porangahau River boundary. | Beca (2021:P:D.66) |
| Coastal Hazard Zones<br><br>Regional Coastal Environment Plan (RCEP) | Zone 1 – Land identified as being subject to storm erosion, short-term fluctuations and dune instability and includes river/stream mouth areas susceptible to both erosion and inundation due to additional hydraulic forcing of river or estuary systems.<br><br>Zone 3 – Land assessed as being at risk to sea water inundation in a 1 in 50 year combined tide and storm surge event, and includes allowance for sea level rise, but doesn't include land within CHZ1 or CHZ2. | CHZ1 extends along the eastern property boundary at no greater than 60 m inland from the boundary fence line. CHZ3 is confined to a small proportion of the alluvial plain to the north-east of the property.<br>No irrigation will occur within CHZ1, with only small moveable pods being used in CHZ3, capable of being shifted, suspended and removed from CHZ3 in the event of coastal inundation. | Beca (2021:P:D.90) |

# 6 LAND MANAGEMENT

## 6.1 General

To operate a successful discharge regime across the Site, the management of irrigation rates, cropping and/or grazing rotation and protection of landforms and cultural sites is needed. Land management considerations are as follows.

## 6.2 Land Ownership and Management Responsibility

The land for irrigation is managed by the Stoddart family. A detailed evaluation of the Site is given in the report *Evaluation of Soils to Receive Porangahau and Te Paerahi Wastewater* (LEI, 2020:P:B.15). The landowner of the Site available for irrigation at the time of preparing this conceptual design is given in Table 6.1 and with the property shown in Figure 6.1.

**Table 6.1: Land Ownership**

| **Landowner** | Stoddart (Southern Parcel) | Stoddart (Northern Parcel) |
|---|---|---|
| **Site Address** | 474 Beach Road, Porangahau | 474 Beach Road, Porangahau |
| **Legal Description** | LOT 2 DP 3877 | LOT 3 DP 2741 |
| **Map Reference** | 1910364 E, 5533274 N | 1910717 E, 5533843 N |
| **Area (ha)** | 81.2 | 33.1 |


**Figure 6.1: 474 Beach Road, Porangahau – Proposed Irrigation Property**

It is acknowledged that the diligent management of the land, including the irrigation, is critical to achieve less than minor adverse effects on the environment. It is also noted that use of land not owned by Council comes with the attendant risk of uncertainty of land tenure.

It is important that the wastewater irrigation fits in with the land management. The day-to-day operation and maintenance of the system will be the responsibility of the landowner. CHBDC as consent holder will monitor to ensure that the irrigation is being managed to comply with conditions of consent.

Formal agreements which define site and system responsibilities are in preparation.

## 6.3 Current Land Use

Currently the land application site can be described as a low to moderate intensity sheep and beef finishing block, with low intensity rotational cropping, predominantly of crops such as chicory, raphno, hunter and oats occurring. The dominant livestock type across the Site is sheep, with ewes brought onto the property from a partnering farm in spring/summer, kept over the winter period and sent to the works in spring. Seasonal fluctuations influence land management and animal numbers across the Site with fertiliser inputs being relatively low. A summary of the current farming system is provided in LEI (2021:P:B.13).

## 6.4 Future Land Use

Wastewater irrigation to the Site is expected to increase existing farm productivity through increased pasture yield and year round security of water for irrigation. In terms of management, the existing farming system will remain relatively the same, albeit with greater flexibility and certainty surrounding animal numbers and cropping rotations. The design concept incorporates the current management style into the design of the discharge regime.

A key component to the future farming system will be the inclusion of wastewater irrigation over part of the site and corresponding, increased pasture growth. The area which is likely to receive the largest proportion of irrigation is the central sand dunes which are prone to drying out in summer months due to low water holding capacity. Pasture production is currently low on this landform.

The ability to increase pasture production through irrigation across previously low producing land will enable an increase animal numbers across the Site to manage increased pasture growth. Management of nutrient loss due to increased animals on-site has been incorporated into the design criteria for the discharge regime.

The activities and farm production will ramp up as the development stages advance (Section 7.2). Four farm management scenarios have been evaluated representing the current farming system, prior to irrigation; and the farming system that is likely at each of the stages. A summary of the farming system for each of the stages is provided in LEI, 2021:P:C.14a.

## 6.5 Management of Cropping and/or Animal Grazing

For future management following wastewater application, existing cropping is to be primarily maintained to land on the alluvial plain to the north-east, adjacent to the river. The location of crops may vary on a seasonal basis, however this location has been indicated by the landowner as being a suitable cropping location, thus is has been incorporated as being predominantly for crops in future. Crops grown under wastewater application, are not to be exported for human consumption. In addition to crop locations, crop types may vary seasonally depending on farm management and may include crops such as chicory, raphno, turnips and oats.

Under a future 'business as usual' approach, stock will largely graze regularly across the entirety of the property. Cropping blocks will likely see break feeding of crops when plants are at maturity over winter periods, with no grazing events prior to this following sowing. Elsewhere, due to much of the Site being in pasture, grazing events will vary in location and duration depending on animal numbers and seasonal variations.

## 6.6 Land Management Units

For the purposes of modelling and understanding farm management, a series of land management units (LMUs) have been created. The LMU are a combination of landforms and characteristics into practical areas for management. Each LMU should respond in a similar way to the same management approach. The designation of LMUs is mostly based on the landforms and associated soil types outlined in the Site Investigation Report (LEI, 2020:P:B.15). Figure 6.2 shows the distribution of the LMUs.

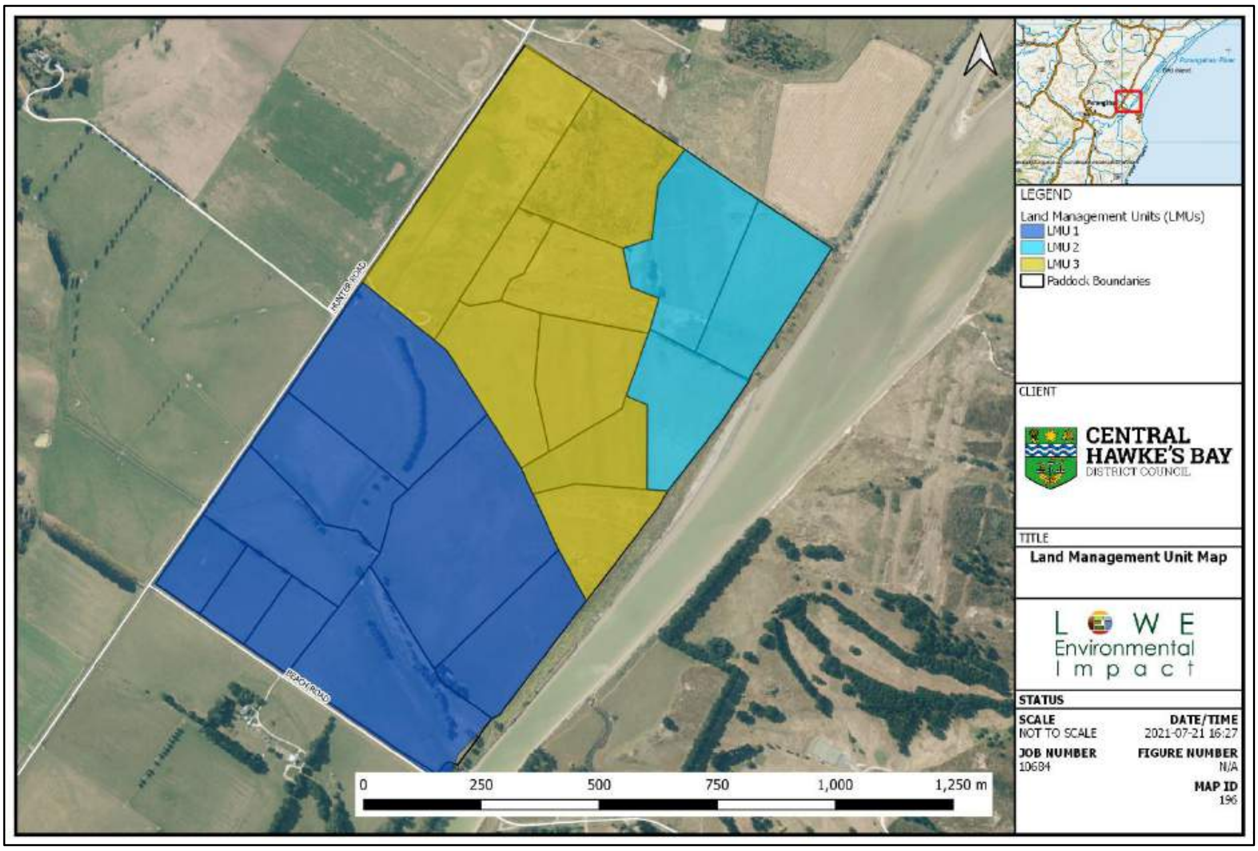


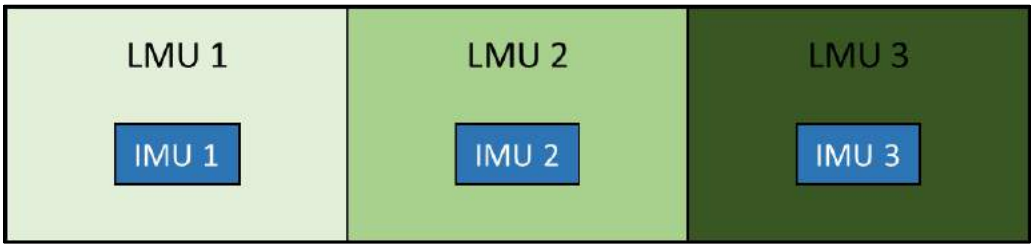

**Figure 6.2: Land Management Unit Map**

In brief three landforms have been identified:

- LMU 1 dominant landform is poorly drained silty/clayey soils to the south;
- LMU 2 dominant landform is poorly to moderately draining loamy alluvium to the north east; and
- LMU 3 dominant landform is well drained central sand dunes.

## 6.7 Irrigation Management Units

Not all of the Site will receive wastewater irrigation. Within the LMUs, Irrigation Management Units (IMU), being a subset of LMUs, can be assigned. The relationship between LMUs and IMUs is shown below.




Of the available area within the LMUs:

- Only part of the area is required for the discharge of wastewater, due to the volume of wastewater available for discharge; and
- Only part of the area is available for wastewater discharge following exclusion of buffer zones, sensitive areas or areas which are unsuitable due to a soil management issues such as drainage limitations (Figure 6.3).

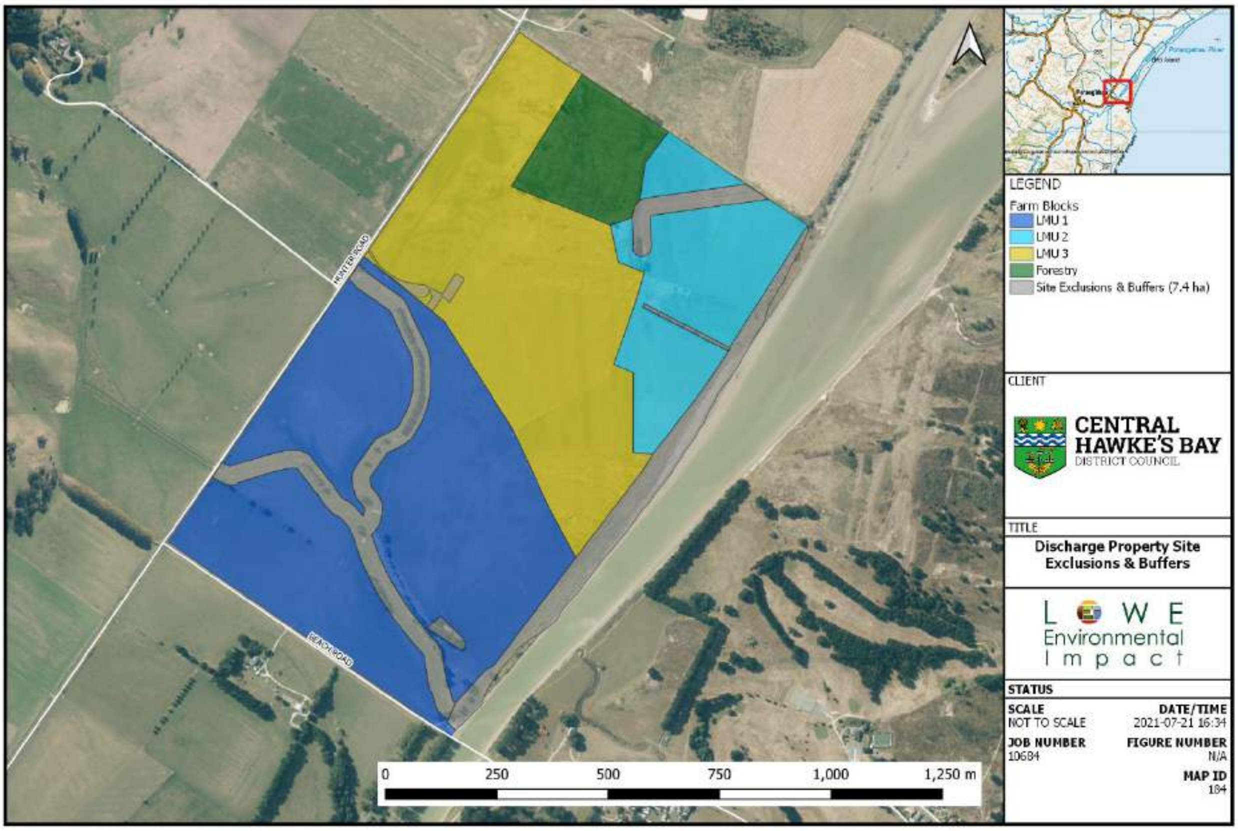



**Figure 6.3: Site Exclusions & Buffers**

The land area of the Site which is available is significantly greater than what is required to fully irrigate all of Porangahau and Te Paerahi's flows to land. This enables additional management flexibility whereby, the IMU block can rotate within the LMU on any given day depending on landowner preference.

For the purposes of evaluating effects, a scenario which has a fixed area of irrigation will have the biggest impact and so that has been evaluated here.

Table 6.2 represents a summary for each of the LMUs and IMUs at Stage 3 of the project.

**Table 6.2: Stage 3 LMU and IMU Summary**

| **Land Management Unit** | LMU 1 | LMU 2 | LMU 3 |
|---|---|---|---|
| **LMU Area (ha)** | 50.8 | 16 | 33.3 |
| **Irrigation Management Unit** | IMU 1 | IMU 2 | IMU 3 |
| **IMU Area within LMU (ha)** | 20 | - | 20 |
| **Landform** | Alluvial plain (south) | Alluvial plain (north-east) | Sand dunes |
| **Proximity to Features** | This unit encompasses the southern portion of the property to which the 20 ha IMU 1 rotates within. This unit features two streams running though its extent and is bounded by Beach & Hunter Roads and the Porangahau River. | This unit comprises the north-eastern alluvial plain, bounded by the Porangahau River, sand dune ridgelines and the drain running along the property's northern boundary. This unit features a small duck pond and a relatively dry drain running through its extent. | This unit includes the higher elevated dune ridgelines running through the property to which the 20 ha IMU 3 block rotates within. This unit runs in a north-south direction, spanning the central to northern extent of the property and is bounded by Hunter Road and the Porangahau River. |
| **Management Type** | Low intensity pastoral grazing of sheep and beef. | Low intensity rotational cropping for sheep over winter months. Low intensity pastoral grazing of sheep and beef. | Low intensity pastoral grazing of sheep and beef. Rotating winter oats crop for beef grazing common. |
| **LMU Management Challenges** | Poorly draining soils so risk of pugging in winter by beef stock. Risk of flooding in 100 yr flood event. | Low to moderate draining soils so risk of winter pugging by beef stock. Minor risk of flooding in 100 yr flood event. | Well-draining soils so increased risk of nutrient leaching following fertiliser applications. Soil dries out in summer months, reducing pasture growth. Minimal to no soil structure below thin topsoil layer, thus risk from wind erosion if topsoil layer is lost. Careful cultivation and stock grazing management required. |
| **IMU Management Challenges** <br> *** (in addition to LMU Management Challenges) *** | Inclusion of wastewater would require appropriate irrigation rates and stock withholding periods to minimise soil pugging and surface water ponding. Appropriate management of beef stock, particularly in winter months (potentially exclude beef from irrigated area altogether in Jul/Aug). | - | Inclusion of wastewater would facilitate substantial increases in pasture growth. Application rates, stock management and land use will need to be carefully managed to minimise nutrient losses. Due to high permeability of soil, high volumes of wastewater will be required to maintain sufficient moisture in soil profile. |

# 7 DISCHARGE REGIME

## 7.1 General

Section 7 presents the method to determine a discharge regime for the Porangahau and Te Paerahi WWTPs to a designated land application site.

## 7.2 Proposed Staging of Discharge Development

The development of the discharge system for Porangahau and Te Paerahi's wastewater is proposed to be staged. This allows for a rapid reduction in the amount of treated wastewater discharged via the current discharge systems to the respective receiving environments, while managing the costs to Council and the time for procurement and construction to occur. A summary of the proposed stages is as follows:

- **Stage 0** allows for the current discharge for both communities to their respective receiving environments to occur for up to four years at Te Paerahi and six years at Porangahau from consent granting while the subsequent stages are enacted;

- **Stage 1** involves provision of 500 $m^3$ of storage within the Te Paerahi WWTP and development of a minimum 4 ha on the Discharge Property, allowing irrigation to sandy soils (IMU 3) under typical irrigation conditions for approximately 43 % of the **current** Te Paerahi average annual wastewater discharge volume and 57 % of the annual volume under a non-deficit wet soils regime. This stage **only** includes Te Paerahi flows and applies all to the Discharge Property, while the existing river discharge for Porangahau will continue.

  The discharge regime assumes that the currently occurring wastewater flows occur (no allowance for future growth), up to 500 $m^3$ of storage is available at the Te Paerahi WWTP and discharge under a non-deficit wet soils regime can occur when soils cannot receive wastewater under typical irrigation conditions;

- **Stage 2** involves development of an additional 6 ha of irrigation for sandy soils (IMU 3), allowing for a minimum 10 ha of irrigation at Stage 2. Stage 2 allows for irrigation to IMU 3 (wet and regular irrigation regimes) of between 61 % to 100 % of the **future (2028)** Porangahau and Te Paerahi annual wastewater discharge volumes. This stage includes **both** Porangahau and Te Paerahi flows, but allows for between 0 % to 39 % of all flows to continue to the Porangahau River (when storage is not possible and soil conditions are too wet).

- **Stage 3** involves development of an additional 10 ha of irrigation for sandy soils (IMU 3) and incorporation of 20 ha of silty/clay soils (IMU 1), allowing for a minimum 40 ha of irrigation at Stage 3. A new combined WWTP and storage pond is to be built at the land application site to receive Porangahau and Te Paerahi flows with a capacity of (up to) 35,000 $m^3$. This storage allows for irrigation of between 66 % and 100 % of the **future (2057)** average annual wastewater discharge volume to the regular irrigation system (typical irrigation) and between 0 % to 36 % to be applied under a non-deficit wet soil regime.

Details of the Stage 0 existing discharges for the respective WWTPs are given in the report (Beca, 2020:P:C.10) and are not discussed further here.

An evaluation of treated wastewater flows to be discharged to land at each stage has been made on the basis of the historical record of wastewater flows and climatic conditions. A summary of the discharge regime for each stage is given in the following sections.

## 7.3 Determination of Design Irrigation Rate

In November 2020 LEI conducted a detailed site investigation of the Site. Key parameters are summarised in the Site Investigation report (LEI, 2020:P:B.15). An appropriate irrigation application depth has been determined from field testing of soil unsaturated hydraulic conductivity ($K_{-40\ mm}$). The most conservative $K_{-40\ mm}$ as determined in the Site Investigation report (LEI, 2020:P:B.15) is 11 mm/h for silty/clay soils and 14 mm/h for sandy soils, corresponding to design irrigation application depths of 79 mm/d and 101 mm/d respectively using the method of Crites and Tchobanoglous (1998). For practical irrigation purposes and to be protective of groundwater this value has been adjusted to up to 20 mm/d. This application depth applies across all IMUs.

Using the **design irrigation application depth of 20 mm/d** will restrict irrigation water movement through the soil to matrix flow, thereby maximising the travel time in the soil and contact with soil particles. This is intended to maximise sorption, filtration and plant removal of applied nutrients and pathogens. An instantaneous irrigation rate not exceeding the lowest $K_{-40mm}$ of 11 mm/h for the Site will be adopted to avoid ponding or run-off of wastewater. A **rate of 10 mm/h is proposed**. Applying at this rate will further reduce risks associated with run-off since in the event of high rainfall events with the potential for overland flow, negligible wastewater and associated contaminants will be at the soil surface.

The design irrigation depths and rates discussed here are the maxima for the Site however, there is potential to reduce the per event application rate to fit in with land management requirements and to optimise the discharged volumes. This is discussed further below.

## 7.4 Determination of Discharge Regime

In order to determine the proportion of wastewater that can be applied to a land area, and the amount of storage required, a water balance approach has been used to develop a land application regime. This section summarises the methodology used to build the regime.

### 7.4.1 Water Balance Principle

There are a number of processes to be considered when applying treated wastewater to land. The use of a water balance enables these processes to be quantified and then considered together. This water balance approach is based on an empirical water and nutrient budget for a land discharge system. In the case of the stages presented, actual data (typically daily) is used and so the outputs represent how the system would have operated for the period of the dataset.

### 7.4.2 Water Balance Key Inputs

Specific input data used includes:

- **Daily wastewater outflow volumes:** Data was available for the period 1 January 2008 to 30 November 2019. Gaps in data sets were populated with estimates based on previous outflow data. As noted in Section 4.2, flows were adjusted for future growth in Porangahau and Te Paerahi;
- **Mean wastewater quality:** While wastewater quality is expected to vary across a year, nutrient data is considered in the context of yearly loads and so mean values for total N and total P are considered to be appropriate for the water balance. Values are summarised in Table 4.3 for Porangahau and Table 4.4 for Te Paerahi;

- **Daily rainfall data** (for additions to the pond surface and for scheduling irrigation): From the nearest climate station with a reliable complete daily data set. In this case data was sourced from the Waipawa EWS Station [31620] for the period 09/06/2009 to 30/11/2019;
- **Daily Priestly-Taylor Potential Evapotranspiration** (for losses from the land application area): From the nearest climate station with a reliable complete daily data set. In this case the Waipawa EWS Station [31620] as for rainfall; and
- **Daily open-pan evaporation** (for losses from the storage pond surface): From the nearest climate station with a reliable complete daily data set, also from the Waipawa EWS Station [31620] as for rainfall and PET.

### 7.4.3 Variable Inputs to Water Balance

There are many variables for the system which, when manipulated individually, can produce multitudinous outcomes. The variables represent possible day-to-day management decisions such as:

- River flow criteria including flow limits and mass loading limits;
- Irrigation event application depth;
- Area available for irrigation on any day;
- Irrigation limits based on month (% of maximum);
- Irrigation return period;
- Limits to application volumes based on amount of rainfall received over preceding days;
- Soil moisture content triggers to start irrigation;
- Soil permeability and available water holding capacity;
- Inclusion of surface water or rapid infiltration discharge limited by nutrient or hydraulic load;
- Pond dimensions; and
- Minimum volume to be retained in storage.

In order to work with a manageable number of scenarios some decisions have been made as to which variables to fix. These decisions are based on an understanding of the assimilative capacity of the local environment and a need to discharge as much of Porangahau and Te Paerahi's wastewater to land as possible in a sustainable manner, without having a detrimental impact on the land.

The parameters adopted are as determined in the Site Investigation (LEI, 2020:P:B.15) and Water Quality (Beca, 2020:P:B.24) reports.

### 7.4.4 Processing of Data

The water balance considers the system as a series of separate reservoirs and then as interacting systems. The process can be summarised as follows:

- Determine what volume of wastewater is available for discharge (stored volume and inflow);
- Determine if the soil moisture status criteria are met. This a function of the rainfall and/or irrigation received previously, the evapotranspiration for that day and drainage that may have occurred;
- If sufficient wastewater is available and soil moisture status allows, apply wastewater to land area at the prescribed irrigation rate;
- If insufficient wastewater is available from inflow or in storage then no discharge occurs and inflows are directed to storage;

- If there is not sufficient capacity in the soil to receive wastewater (soil moisture is high) and storage is at capacity, direct Porangahau and Te Paerahi outflows to a non-deficit wet soils irrigation regime.

Where multiple land areas are defined i.e. where they have different criteria to allow discharge to occur, or if there are alternative discharges such as surface water or high rate irrigation then the water balance progressively assesses and discharges the wastewater to each management unit sequentially. The order is determined by the priority for each unit – in the case of Porangahau and Te Paerahi, the order is IMU 3, IMU 1, non-deficit wet soil discharge to IMU 3, then storage.

### 7.4.5 Outputs

The water balance produces a daily record of discharges to each of the management units. From this data a summary of the discharge regimes can be produced, including:

- Average annual discharge volume to land irrigation and to high rate discharge;
- Average annual land application depth;
- Days of discharge, both the number of days that discharge could occur (due to soil moisture conditions) and the number of days that the discharge did occur (due mostly to stored volume available);
- Nitrogen (N) and phosphorus (P) load received by the land application area; and
- The maximum storage volume needed to operate a full time land treatment system.

These outputs are given below for the Stages described earlier.

## 7.5 Optimisation of Discharge Scenario

There are three aspects of the discharge system that influence one another; storage, land area and drainage. Each of these aspects can be managed and modified however this comes at a cost which is not always available. Each of these aspects are directly related to one another in that when one is modified (i.e. storage), another is influenced. These modifications to each aspect develop the need for a 'sweet spot' to be identified between each, that is both affordable to Council, but effective for the Project.

Of these components, storage is often modified above others as this is a pre-determined and calculated volume to which modelling is based on. Having a smaller storage volume, increases the land required for irrigation (assuming a 100 % land discharge), as high flow volumes cannot be captured, which in turn influences soil drainage rates. Contrastingly, having a higher storage volume can be expensive and may not be necessary if its full capacity is used infrequently. Therefore, a compromise between storage, land area and drainage is required to manage environmental effects and cost to Council.

Figure 7.1 provides a continuum between these three wastewater system components.

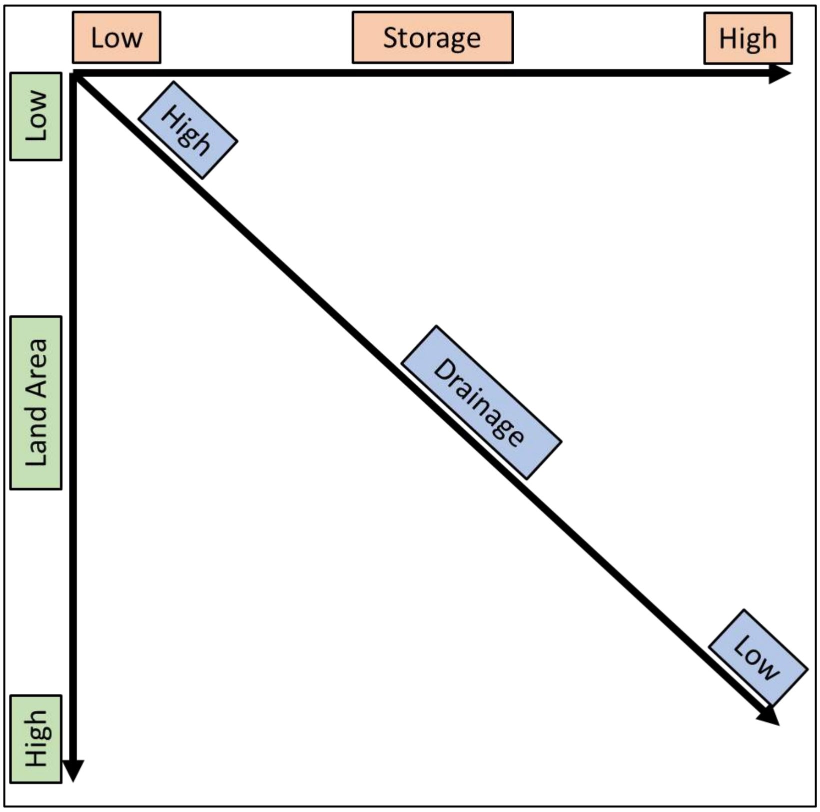



**Figure 7.1: Storage, Land Area and Drainage Continuum**

## 7.6 Stage 1 Discharge Regime (Te Paerahi current flows ONLY)

Details of the management of the Porangahau and Te Paerahi WWTP discharges at Stage 1 are as follows.

### 7.6.1 Wastewater Treatment Plant and Storage

Works to enable Stage 1 to commence will include:

- Minor treatment improvements to existing ponds at Porangahau and Te Paerahi;
- Pipeline from the Te Paerahi WWTP to the irrigation property;
- Establish wet well for inflows and UV treatment at the irrigation property; and
- Establish fixed impact and/or small moveable irrigation infrastructure to at least 4 ha for irrigation of Te Paerahi flows under deficit and non-deficit conditions.

At Stage 1, only land discharge of Te Paerahi's wastewater flows occur. Porangahau's wastewater flows will continue to discharge to the Porangahau River.

### 7.6.1 Discharge to Surface Water

At Stage 1, the existing discharge from the Porangahau WWTP to the Porangahau River will continue under the same, run-of-pipe, regime that currently occurs. A summary of flows and loads to the Porangahau River under Stage 1 are given in Table 7.1.

### 7.6.2 Discharge to Irrigation

Following commencement of Stage 1, irrigation will be applied to an area no less than 4 ha within the area identified as LMU 3 and referred to as IMU 3 as described in Section 6.7. To minimise risk of excessive drainage to groundwater and ultimately via groundwater to surface water, the per event discharge maximum is around 25% of the soils available water holding capacity. The proposed per event discharge rate is **up to 20 mm/d**. Discharge will preferentially occur where a sufficient soil moisture deficit exists.

At the proposed discharge rate, the soil is likely to be able to remove all solids and assimilate all BOD applied from the Te Paerahi WWTP. The proposed discharge regime will result in some drainage in excess of what currently occurs since there may be more water in the soil when rainfall occurs. Conversely, more regular water application and keeping the soil at a slightly higher moisture content is expected to reduce overland flow from rainfall compared to the current, unirrigated situation since water from rainfall will be able to more easily enter soil.

To maximise wastewater nutrient removal, wastewater should be retained in contact with the soil for as long as possible. The following decision criteria are recommended to maximise nutrient removal. Under Stage 1, IMU 3 will be operated preferentially as a deficit irrigation system, where criteria determining on any day whether application to land irrigation can occur are as follows:

- **Deficit irrigation - IMU 3:** Represents a regime similar to freshwater irrigation that is common in the wider district. A small amount of nutrient leaching can be expected. A deficit system has been adopted for IMU 3 since no rotation around the block is proposed (no resting period) if only the minimum 4 ha of irrigation is installed. The criteria to discharge are:
    - **Soil moisture status:** Irrigation will not cause the soil moisture to exceed field capacity;
    - **Application rate control:** Vary the application depth to "top-up" a deficit whenever it occurs;
    - **Wind speed and direction:** Irrigation may occur if wind speed is less than 12 m/s, or 4 m/s in the direction of any dwelling within 300 m of the irrigated area;
    - **Previous rainfall:** Irrigation may occur if less than 50 mm rain has fallen in the preceding 3 days; and
    - **Crop condition / harvest schedule / animal rotation:** Harvest or grazing should not occur within 48 h of irrigation ceasing, and irrigation should not be commenced within 24 h of completion of harvest or removal of stock.

There is no alternative discharge or ability to store wastewater for the Te Paerahi flows at Stage 1 and so all flows will be discharged to land. In the event that the criteria above are not able to be met, the discharge can proceed with the same event maximum (20 mm) but will be recorded as a non-deficit (wet soils) discharge. A description of the non-deficit (wet soils) irrigation regime is provided in Section 8.2. For an average year, wet year and dry year, the regime management outcomes are given in Table 7.1.

The regime outcomes assume that currently occurring wastewater flows occur, up to 500 $m^3$ of storage is available at the Te Paerahi WWTP and discharge under the non-deficit wet soil regime can occur only when soil conditions prevent deficit irrigation.

**Table 7.1: Stage 1 – Discharge Management Outcomes (4 ha)**

| Regime | Average Year | Wet year | Dry Year |
|---|---|---|---|
| **DEFICIT IRRIGATION – Regular Irrigation (Dry Soils)** | | | |
| **Annual application depth (mm)** | 255 | 354 | 244 |
| **Maximum application rate per event** | 20 mm/d | 20 mm/d | 20 mm/d |
| **Volume per year** | 10,150 $m^3$ | 14,179 $m^3$ | 9,750 $m^3$ |
| **N mass loading (from wastewater)** | 51 kg N/ha/y | 70 kg N/ha/y | 49 kg N/ha/y |
| **P mass loading (from wastewater)** | 13 kg P/ha/y | 18 kg P/ha/y | 12 kg P/ha/y |
| **NON-DEFICIT IRRIGATION – Wet Soils** | | | |
| **Annual application depth (mm)** | 350 | 546 | 147 |
| **Maximum application rate per event** | 20 mm/d | 20 mm/d | 20 mm/d |
| **Volume per year** | 14,460 $m^3$ | 21,830 $m^3$ | 5,900 $m^3$ |
| **N mass loading (from wastewater)** | 70 kg N/ha/y | 110 kg N/ha/y | 29 kg N/ha/y |
| **P mass loading (from wastewater)** | 18 kg P/ha/y | 30 kg P/ha/y | 7 kg P/ha/y |
| **CONTINUED DISCHARGE TO PORANGAHAU RIVER** | | | |
| **Volume per year** | 54,000 $m^3$ | 66,215 $m^3$ | 30,055 $m^3$ |
| **N mass loading (from wastewater)** | 1,076 kg N/y | 1,324 kg N/y | 601 kg N/y |
| **P mass loading (from wastewater)** | 269 kg P/y | 331 kg P/y | 150 kg P/y |

During a dry year, the discharge to land for deficit irrigation is in the order of 62 % of that year's annual wastewater flows. For a wet year this reduces to 39 % even though the total discharged is higher. All remaining flows from the Te Paerahi WWTP that are not discharged via a deficit irrigation regime will be applied under the non-deficit (wet soils) irrigation regime. This will ensure that 100% of flows from the Te Paerahi WWTP under Stage 1 are discharged to land in one form or another. It should be noted that the non-deficit (wet soils) irrigation regime discharges via the same irrigation infrastructure that the soil moisture controlled deficit irrigation occurs and so water and nutrient loads in Table 7.1 are cumulative. A description of the non-deficit (wet soils) irrigation regime is provided in Section 8.2.

From Table 7.1, nitrogen and phosphorus loads from wastewater are relatively small to the farming system, thus additional fertiliser inputs will be required to increase pasture production.

The evaluation given here assumes that 4 ha of irrigation will be operated, which is a sustainable irrigation regime. In practice it would be desirable to have a larger area of irrigation available (within the areas identified as suitable in Section 6.7, Figure 6.3) to enable some flexibility with the farming system. For the purpose of assessing effects, the scenario presented here is considered the "worst case scenario" which minimises the potential for underestimating effects from the activity.

## 7.7 Stage 2 Discharge Regime (Porangahau and Te Paerahi future flows)

Details of the management of the Porangahau and Te Paerahi WWTP discharges at Stage 2 are as follows.

### 7.7.1 Treatment Plant and Storage

Works to enable Stage 2 to commence will include:

- Pipeline from the Porangahau WWTP to the irrigation property; and
- Establish fixed impact and/or small moveable irrigation infrastructure to at least 10 ha (an additional 6 ha from Stage 1) for irrigation of Porangahau and Te Paerahi flows under non-deficit conditions.

Stage 2 is calculated on predicted 2028 flows from the Porangahau and Te Paerahi WWTPs.

### 7.7.1 Stage 2 Discharge Scenarios

Two discharge scenarios are discussed here. Stage 2a applies 100 % of Porangahau and Te Paerahi's flows to land using a deferred irrigation approach and when wet a non-deficit (wet soils) regime. The deferred irrigation approach is predominately deficit irrigation, but with occasionally applications exceeding field capacity (non-deficit), with the storage used to buffer the need for higher application rates to be used.

Stage 2b sees wastewater flows from both Te Paerahi and Porangahau directed to the irrigation property, however if soil moisture criteria aren't met the Porangahau wastewater is directed to the existing river outfall. This partial river discharge allows for some of the wastewater volumes directed to the wet soils irrigation regime as set out in the Stage 2a example to be diverted to the river. A description of the non-deficit (wet soils) irrigation regime is provided in Section 8.2.

Each of these sub-stages (2a and 2b) allows assessment of the worst case scenario to occur i.e. 100 % to land or as much to land as practically possible and the balance to the river. In practice a system which is predominantly to land but includes some contingency discharge to the river is likely.

### 7.7.2 Discharge to Irrigation

Following commencement of Stage 2, an additional 6 ha will be available for irrigation totalling an irrigation area of 10 ha over IMU 3. Stage 2 will allow for a mix of deficit and deferred/non-deficit irrigation for both Stages 2a and 2b. As with Stage 1, the per event discharge maximum is around 25% of the soils available water holding capacity. The proposed rate of discharge per event is **up to 20 mm/d**.

In addition to the deficit criteria given in 7.6.2, the following decision criteria are recommended for inclusion in Stage 2:

- **Deferred, non-deficit irrigation – IMU 3:** Represents a regime which maximises the volume of discharge to land while protecting the land from damage by over-watering and avoiding excessive leaching to groundwater or surface water. The application system will see a minimal increase in application depth over field capacity. A portion of applied nitrogen will be transported to groundwater and surface water by leaching but will enter surface water as a diffuse discharge and at a substantially lower mass loading than would occur due to a direct discharge from the Porangahau WWTP. The criteria to discharge under the deferred, non-deficit irrigation regime are:
    - **Soil moisture status:** Irrigation will not cause the soil to exceed field capacity by more than 2 mm per event;
    - **Application rate control:** Vary the discharge rate to match the soil moisture criteria;
    - **Depth to groundwater:** Irrigation should not occur when the groundwater table is less than 1 m from the soil surface;

- **Wind speed and direction:** Irrigation may occur only if wind speed is less than 12 m/s, or 4 m/s in the direction of any dwelling within 300 m of the irrigated area;
- **Previous rainfall:** Irrigation may occur if less than 20 mm rain has fallen in the 24 hours prior to commencement of irrigation; and
- **Crop condition / harvest schedule / animal rotation:** Harvest or grazing should not occur within 48 h of irrigation ceasing, and irrigation should not be commenced within 24 h of completion of harvest or removal of stock. In practice, irrigation is unlikely to occur in the week leading up to harvest and until obvious crop growth is visible however this limit is to manage environmental effects of the irrigation.

Adopting the same decision criteria as described for Stage 1 results in outcomes given in Table 7.2.

**Table 7.2: Stage 2a – Discharge Management Outcomes**

| Regime | Average Year | Wet year | Dry Year |
|---|---|---|---|
| **DEFICIT AND NON-DEFICIT (DEFERRED) IRRIGATION – Regular Irrigation (Dry Soils)** | | | |
| **Annual application depth (mm)** | 307 | 368 | 292 |
| **Maximum application rate per event** | 20 mm/d | 20 mm/d | 20 mm/d |
| **Volume per year** | 30,700 $m^3$ | 36,900 $m^3$ | 29,200 $m^3$ |
| **N mass loading (from wastewater)** | 61 kg N/ha/y | 74 kg N/ha/y | 58 kg N/ha/y |
| **P mass loading (from wastewater)** | 15 kg P/ha/y | 18 kg P/ha/y | 15 kg P/ha/y |
| **NON-DEFICIT IRRIGATION – Wet Soils** | | | |
| **Annual application depth (mm)** | 710 | 937 | 341 |
| **Maximum application rate per event** | 20 mm/d | 20 mm/d | 20 mm/d |
| **Volume per year** | 71,000 $m^3$ | 93,800 $m^3$ | 34,100 $m^3$ |
| **N mass loading (from wastewater)** | 142 kg N/ha/y | 187 kg N/ha/y | 68 kg N/ha/y |
| **P mass loading (from wastewater)** | 35 kg P/ha/y | 47 kg P/ha/y | 17 kg P/ha/y |
| **CONTINUED DISCHARGE TO PORANGAHAU RIVER** | | | |
| **Volume per year** | 0 $m^3$ | 0 $m^3$ | 0 $m^3$ |
| **N mass loading (from wastewater)** | 0 kg N/y | 0 kg N/y | 0 kg N/y |
| **P mass loading (from wastewater)** | 0 kg P/y | 0 kg P/y | 0 kg P/y |

Due to high winter/spring wastewater flows from Porangahau, the amount of wastewater discharge that occurs under the non-deficit (wet soils) regime is high. As for Stage 1, the non-deficit (wet soils) regime discharges via the same irrigation infrastructure that the soil moisture controlled irrigation occurs and so water and nutrient loads in Table 7.2 are cumulative. Only the discharge criteria are different. A description of the non-deficit (wet soils) irrigation system is provided in Section 8.2.

It should be noted that the non-deficit (wet soils) discharge is not considered to be a high rate discharge. As with Stage 1, additional fertiliser inputs will be required to increase pasture production.

For Stage 2b, a proportion of this wastewater that would be directed to the wet soils system under Stage 2a, will instead, be discharged to the Porangahau River via the existing outfall. The outcomes of Stage 2b are given in Table 7.3.

**Table 7.3: Stage 2b – Discharge Management Outcomes**

| Regime | Average Year | Wet year | Dry Year |
|---|---|---|---|
| **DEFICIT AND NON-DEFICIT (DEFERRED) IRRIGATION – Regular Irrigation (Dry Soils)** | | | |
| **Annual application depth (mm)** | 320 | 370 | 300 |
| **Maximum application rate per event** | 20 mm/d | 20 mm/d | 20 mm/d |
| **Volume per year** | 32,000 $m^3$ | 37,000 $m^3$ | 30,000 $m^3$ |
| **N mass loading (from wastewater)** | 63 kg N/ha/y | 74 kg N/ha/y | 60 kg N/ha/y |
| **P mass loading (from wastewater)** | 16 kg P/ha/y | 18 kg P/ha/y | 15 kg P/ha/y |
| **NON-DEFICIT IRRIGATION – Wet Soils** | | | |
| **Annual application depth (mm)** | 170 | 220 | 100 |
| **Maximum application rate per event** | 20 mm/d | 20 mm/d | 20 mm/d |
| **Volume per year** | 17,000 $m^3$ | 22,000 $m^3$ | 10,000 $m^3$ |
| **N mass loading (from wastewater)** | 34 kg N/ha/y | 45 kg N/ha/y | 19 kg N/ha/y |
| **P mass loading (from wastewater)** | 8 kg P/ha/y | 11 kg P/ha/y | 5 kg P/ha/y |
| **CONTINUED DISCHARGE TO PORANGAHAU RIVER** | | | |
| **Volume per year** | 53,000 $m^3$ | 71,100 $m^3$ | 23,400 $m^3$ |
| **N mass loading (from wastewater)** | 1,050 kg N/y | 1,420 kg N/y | 490 kg N/y |
| **P mass loading (from wastewater)** | 260 kg P/y | 350 kg P/y | 120 kg P/y |

Stage 2b shows a significant reduction in the portion going to the non-deficit (wet soils) discharge compared to Stage 2a. This will result in a lower risk of nutrient loss from the site but is offset by including a river discharge. The increase in total community flows predicted by Stage 2 (Section 4.2) results in the discharge to river being a similar volume to that which currently occurs. However, the distribution of the discharge through the year is different, with no discharge occurring below ½ median flow, and 75 % of the river discharge occurring between May and September inclusive.

## 7.8 Stage 3 Discharge Regime (future flows)

Details of the management of the WWTP discharge at Stage 3 are as follows.

### 7.8.1 Treatment Plant and Storage

Works to enable Stage 3 to commence will include:

- Install storage for times irrigation cannot occur;
- Construction of a new combined WWTP at the discharge property servicing both communities;
- Construction of a 10,000 – 35,000 $m^3$ storage pond; and
- Establish fixed impact or small moveable irrigation infrastructure to at least 40 ha (additional 30 ha) for irrigation of Porangahau and Te Paerahi's future flows under both deficit and non-deficit conditions.

Stage 3 incorporates projected future 2057 population growth and flows from the Porangahau WWTP to the discharge property as outlined in Section 4.2.

### 7.8.1 Stage 3 Discharge Scenarios

Two Stage 3 scenarios are described. The distribution of the discharge through the year is significantly impacted by the ability to store the wastewater until ideal soil conditions exist.

- **Stage 3a** represents a minimum storage volume to achieve a long term sustainable discharge to land with a low environmental footprint.

- **Stage 3b** represents an optimised storage volume to get maximum productive gain and optimum water and nutrient retention at the Site.

These stages see all flows, with incorporated future 2057 population projections, directed to the discharge property with **no** river discharge occurring.

Table 7.4 and Table 7.5 represents the regime management outcomes for Stage 3a and Stage 3b respectively.

### 7.8.2 Discharge to Irrigation

Following commencement of Stage 3 a total of 40 ha (20 ha of IMU 1 and 20 ha of IMU 3) will be available for irrigation. For IMU 1, the discharge regime is a deficit system containing the same irrigation conditions as outlined in Stage 1 for IMU 3. For IMU 3, the proposed discharge and management regime is the same as adopted for Stages 2a and 2b. In both scenarios only 10 ha is used for the wet soils discharge. A description of the non-deficit (wet soils) irrigation regime is provided in Section 8.2.

Stage 3 accounts for future 2057 population growth which is not expected to eventuate until the end of the consent term (2050-2057) but have been considered here to ensure the regime can be operated sustainably for at least 35 years. Table 7.4 gives the outcomes for Stage 3a.

### Table 7.4: Stage 3a – Discharge Management Outcomes

| Regime | Average Year | Wet year | Dry Year |
|---|---|---|---|
| **DEFICIT AND NON-DEFICIT (DEFERRED) IRRIGATION – Regular Irrigation (Dry Soils)** | | | |
| **Annual application depth (mm)** | 305 | 395 | 215 |
| **Maximum application rate per event** | 20 mm/d | 20 mm/d | 20 mm/d |
| **Volume per year** | 121,100 $m^3$ | 158,100 $m^3$ | 85,700 $m^3$ |
| **N mass loading (from wastewater)** | 61 kg N/ha/y | 79 kg N/ha/y | 43 kg N/ha/y |
| **P mass loading (from wastewater)** | 15 kg P/ha/y | 20 kg P/ha/y | 11 kg P/ha/y |
| **NON-DEFICIT IRRIGATION – Wet Soils** | | | |
| **Annual application depth (mm)** | 663 | 765 | 394 |
| **Maximum application rate per event** | 20 mm/d | 20 mm/d | 20 mm/d |
| **Volume per year** | 66,300 $m^3$ | 76,500 $m^3$ | 39,400 $m^3$ |
| **N mass loading (from wastewater)** | 133 kg N/ha/y | 153 kg N/ha/y | 79 kg N/ha/y |
| **P mass loading (from wastewater)** | 33 kg P/ha/y | 38 kg P/ha/y | 20 kg P/ha/y |
| **STORAGE** | | | |
| **Maximum storage ($m^3$)** | 10,900 | | |
| **$90^{th}$ Percentile storage ($m^3$)** | 1,000 | | |

As shown in Table 7.4, for an average year the discharge via the non-deficit wet soils system is around 35 % of the total flows. In this scenario the storage volume required seldom exceeds 1,000 $m^3$ but for some of the time around 11,000 $m^3$ of storage is required.

The example shown in Table 7.4 represents a worst case scenario for assessment. In practice, the discharge via the non-deficit (wet soils) could be rotated around the site since the discharge is via the existing irrigation system. In this situation around 170 mm would be discharged in an average year (33 kg N/ha, 8 kg P/ha).

Stage 3b summarises a system where the discharge is optimised for maximum plant use of water and nutrients. The trade-off is a high storage requirement and the associated capital cost and maintenance requirements. Table 7.5 gives the Stage 3b outcomes.

**Table 7.5: Stage 3b – Discharge Management Outcomes**

| Regime | Average Year | Wet year | Dry Year |
|---|---|---|---|
| **DEFICIT IRRIGATION – Regular Irrigation (Dry Soils)** | | | |
| **Annual application depth (mm)** | 468 | 589 | 307 |
| **Maximum application rate per event** | 20 mm/d | 20 mm/d | 20 mm/d |
| **Volume per year** | 187,157 $m^3$ | 235,576 $m^3$ | 122,887 $m^3$ |
| **N mass loading (from wastewater)** | 94 kg N/ha/y | 118 kg N/ha/y | 61 kg N/ha/y |
| **P mass loading (from wastewater)** | 23 kg P/ha/y | 29 kg P/ha/y | 15 kg P/ha/y |
| **NON-DEFICIT IRRIGATION – Wet Soils** | | | |
| **Annual application depth (mm)** | 0 | 0 | 0 |
| **Maximum application rate per event** | 0 mm/d | 0 mm/d | 0 mm/d |
| **Volume per year** | 0 $m^3$ | 0 $m^3$ | 0 $m^3$ |
| **N mass loading (from wastewater)** | 0 kg N/ha/y | 0 kg N/ha/y | 0 kg N/ha/y |
| **P mass loading (from wastewater)** | 0 kg P/ha/y | 0 kg P/ha/y | 0 kg P/ha/y |
| **STORAGE** | | | |
| **Maximum storage ($m^3$)** | 35,500 | | |
| **$90^{th}$ Percentile storage ($m^3$)** | 10,300 | | |

Stage 3b sees all wastewater flows directed to the soil moisture controlled deficit and deferred/non-deficit irrigation system, with no use of the non-deficit (wet soils) system. This is achieved by having enough storage to hold wastewater until soil conditions favour soil retention and plant uptake. Here annual application depths increase to the deferred/non-deficit system as compared to Stage 3a due to wastewater previously directed to the non-deficit irrigation (wet soils) system, instead being discharged to the deferred/non-deficit irrigation system. As with Stage 3a, applied nutrient loadings to the existing farming system are relatively small, thus additional nutrients in the form of fertiliser will be required.

### 7.8.3 Storage of Treated Wastewater

At Stage 3, it is proposed that dedicated storage will be provided for the treated wastewater. The storage will be actively managed to ensure that there is capacity available during periods when no discharge to land can occur due to high soil moisture and/or rainfall.

The provision of storage has a number of advantages for the scheme which include:

- Ensuring the discharge to land is sustainable by directing wastewater to storage during wet periods when discharge to land might cause land damage;
- Minimising the need to discharge wastewater directly to the wet soils system where a higher risk of leaching occurs; and
- Enabling the discharge to land to occur when maximum productive benefit can be achieved i.e. by storing wastewater during wet winter months when highest flows enter the WWTP, it is able to be used during the summer (water short) months when inflow to the WWTP are unable to meet the plant requirements for water.

The amount of storage required is determined from the water balance and is based on daily data as described in Section 7.4.

The maximum storage volume needed varies from year to year as a result of wastewater inflow and climatic variations. The storage will need to be engineered to manage periods with minimal wastewater in storage. If contingency discharge is required, it is possible to irrigate in conditions outside of the criteria given with modification to land management and for short periods. This can be controlled through a contingency provision in the discharge management plan(s).

## 7.9 Nutrient Impacts of Discharge

While the discharge regime is designed to minimise rapid drainage some drainage and associated nutrient loss is to be expected from the Site; for instance, as a result of a rainfall event. Management of the irrigation and land will be designed to avoid excessive loss. The proposed regime is intended to be sustainable for the lifetime of the land application scheme.

The nutrient losses from the Site are considered here as they relate to the combined operation of both the wastewater discharge (Section 7.6 to 7.8) and the management of the farm (Section 6). A detailed description of the farming system modelled using Overseer™ is given in LEI (2021:P:B.13) and LEI (2021:P:C.14a). It is acknowledged that nutrient inputs from wastewater alone to the farm system are relatively low. Additional nutrients in the form of fertiliser will be required and contribute to the modelled losses summarised in Table 7.6.

**Table 7.6: Nutrient Loss Summary**

| | River and Coast | | Farm | | | |
|---|---|---|---|---|---|---|
| | N (kg/y) | P (kg/y) | N (kg/y) | N (kg/ha/y) | P (kg/y) | P (kg/ha/y) |
| **Current (Stage 0)** | 1,532 | 353 | 2,349 | 21 | 71 | 0.6 |
| **Stage 1 – (TP)** | 1,076 | 270 | 2,546 | 22 | 94 | 0.8 |
| **Stage 2a – (P+TP)** | 0 | 0 | 3,490 | 31 | 155 | 1.4 |
| **Stage 2b – (P+TP)** | 1,050 | 260 | 2,819 | 25 | 113 | 1 |
| **Stage 3a – (P+TP)** | 0 | 0 | 3,301 | 29 | 205 | 1.8 |
| **Stage 3b – (P+TP)** | 0 | 0 | 3,014 | 26 | 201 | 1.8 |

The nutrient loss to the river and coast is by the existing discharge i.e. direct river discharge to the Porangahau River and discharge to the existing Te Paerahi dune discharge (Stage 0 only). The farm nutrient loss represents the loss from the soil. There is likely to be additional reduction in nutrients as the leached water travels toward a surface water or other receptor however it has been assumed that no attenuation occurs to examine a worst-case scenario when assessing effects.

### 7.9.1 Nitrogen Losses

The nitrogen losses via leaching have been predicted using Overseer™ and are detailed in LEI (2021:P:C.14a). Table 7.4 gives nitrogen leaching estimates from the irrigation site under each of the discharge stages given in Sections 7.6 to 7.8. The nitrogen leaching estimates assume that supplementation of nitrogen from wastewater will be needed i.e. nitrogen loading includes both wastewater nitrogen and fertiliser application. Assuming no attenuation of nitrogen in groundwater or the riparian zone, the changes in the nitrogen entering the river and estuary system are:

- Stage 1: 7 % decrease in nitrogen lost to groundwater and surface water
- Stage 2a: 0 % decrease in nitrogen lost to groundwater and surface water
- Stage 2b: 10 % decrease in nitrogen lost to groundwater and surface water
- Stage 3a: 15 % decrease in nitrogen lost to groundwater and surface water

- Stage 3b: 22 % decrease in nitrogen lost to groundwater and surface water

Assuming that all leached nitrogen eventually enters the surface water environment, then the land application results in a reduction of nitrogen currently discharged to surface water from the land management and from the current direct discharge of wastewater to the Porangahau River and dunes. There is likely to be additional attenuation of nitrogen in the groundwater environment prior to reaching surface water and so the reduction in nitrogen reaching surface water is expected to be greater than that described here. Further, it should be remembered that the calculations provided here are under conditions that see greater flow (and nitrogen) as a result of growth within the communities.

Nitrogen leaching losses in drainage are predicted to increase, peaking at 49 % higher than the existing land use and farm management (if Stage 2a is pursued) and settling at 28 to 41 % higher than current. It should be noted that, while there is a net increase in nitrogen leached from the Site, there is actually a significant reduction in the nitrogen entering the Porangahau River catchment due to the removal of direct discharge of wastewater to surface water.

### 7.9.2 Phosphorus Losses

The primary mechanism for phosphorus loss is via overland flow. Projected phosphorus losses are given in Table 7.4 for each of the stages. All wastewater that is applied to the land, whether it be for irrigation or to the non-deficit (wet soils) irrigation system will be up taken by plans, adsorbed to soil or lost via overland flow. Irrespective of the endpoint of added phosphorus, phosphorus losses to the Porangahau River will be reduced dramatically due to the cessation of a discharge river discharge.

Phosphorus loss from the irrigated site will be avoided by the maintenance of suitable buffers from waterways, and by application of wastewater using an instantaneous application rate that is less than the soils unsaturated hydraulic conductivity i.e. so that water on the Site goes into the soil and does not pond or flow across the surface. The predicted change in the phosphorus entering the river and estuary system are:

- Stage 1: 20 % decrease in phosphorus lost to groundwater and surface water
- Stage 2a: 66 % decrease in phosphorus lost to groundwater and surface water
- Stage 2b: 18 % decrease in phosphorus lost to groundwater and surface water
- Stage 3a: 55 % decrease in phosphorus lost to groundwater and surface water
- Stage 3b: 56 % decrease in phosphorus lost to groundwater and surface water

## 7.10 Summary of Discharge Regime

The key parameters of the discharge regime are given in Table 7.7.

**Table 7.7: Land Discharge and Management Summary**

| Parameter | Current Stage 0 | Stage 1 (TP) | Stage 2a (P+TP) | Stage 2b (P+TP) | Stage 3a (P+TP) | Stage 3b (P+TP) |
|---|---|---|---|---|---|---|
| Storage volume ($m^3$) | ~1,000 | ~500 | ~1,000 | ~1,000 | ~10,900 | ~35,500 |
| Average annual outflow from WWTPs ($m^3$) | ~76,600 | ~24,600 (~76,600) | ~102,000 | | ~183,000 | |
| **Discharge to Porangahau River and Te Paerahi Coast** | | | | | | |
| Volume per year ($m^3$) | ~52,000 | ~52,000 | - | ~53,000 | 0 | 0 |
| N mass loading from wastewater (kg/y) | 1,532 | 1,076 | 0 | 1,050 | 0 | 0 |
| P mass loading from wastewater (kg/y) | 353 | 269 | 0 | 260 | 0 | 0 |
| **Deficit/Non-Deficit Irrigation – Regular Irrigation (Dry Soils)** | | | | | | |
| Irrigation regime | Nil | Deficit | Deferred, non-deficit | | | |
| Landform | Nil | Coastal sand dunes | | | Coastal sand dunes and alluvial plains | |
| Total area – including non-irrigated (ha) | 114.3 | | | | | |
| Wastewater irrigated area (ha) | - | 4 | 10 | 10 | 40 | 40 |
| Irrigation event application (mm/event) | - | Up to 20 | Up to 20 | Up to 20 | Up to 20 | Up to 20 |
| Average annual irrigation volume ($m^3$/y) | - | ~10,000 | ~31,000 | ~32,000 | ~121,000 | ~187,000 |
| Average annual application depth (mm) | - | 255 | 307 | 370 | 305 | 468 |
| Wastewater Nitrogen load (kg N/ha/y) | - | 51 | 61 | 63 | 61 | 91 |
| Wastewater Phosphorus load (kg P/ha/y) | - | 13 | 15 | 16 | 15 | 23 |
| **Non-Deficit Irrigation – Wet Soils** | | | | | | |
| Maximum application rate per event ($m^3$) | - | 20 | 20 | 20 | 20 | 20 |
| Volume per year ($m^3$) | - | ~14,000 | ~71,000 | ~17,000 | ~66,300 | ~0 |
| Average annual application depth (mm) | - | 350 | 710 | 170 | 663 | 0 |
| Wastewater Nitrogen load (kg N/ha/y) | - | 70 | 142 | 34 | 133 | 0 |
| Wastewater Phosphorus load (kg P/ha/y) | - | 18 | 35 | 8 | 33 | 0 |
| **Sand Dunes (LMU 3/IMU 3)** | | | | | | |
| Farm Management current/proposed | Pastoral grazing, rotational cropping | | | | | |
| Vegetation current/proposed | Cocksfoot & marram grasses, winter oats | | | | Cocksfoot & marram grasses | |
| **Alluvial Plains (LMU 1 & 2/IMU 1)** | | | | | | |
| Farm Management current/proposed | Low intensity pastoral grazing/ rotational cropping | | | | | |
| Vegetation current/proposed | Ryegrass pasture; crops (e.g. chicory, raphno, oats, turnips) | | | | | |

# 8 DISCHARGE SYSTEM

## 8.1 System Summary

In summary, the discharge system is proposed to consist of the following components:

- 500 $m^3$ of storage, potentially as freeboard, at the Te Paerahi WWTP for Stage 1. Construction of a pipeline from Te Paerahi to the application site;
- 1,000 $m^3$ of storage between the Porangahau and Te Paerahi WWTPs for Stage 2. Construction of a pipeline from Porangahau to the application site;
- Construction of a new WWTP servicing Porangahau and Te Paerahi and an (up to) 35,000 $m^3$ storage pond for Stage 3.
- Irrigation pump station located at discharge Site built for Stage 1;
- A series of fixed and moveable impact sprinklers; and
- Wet well and pumping to:
  - 4 ha at Stage 1;
  - 6 ha (minimum) additional area at Stage 2; and
  - 30 ha (minimum) additional area at Stage 3.

Further detail is provided below.

## 8.2 Irrigation System Description

Treated wastewater from storage is to be transferred to a wet-well from which it can be pumped to the irrigation system. This will include irrigation under deficit and/or non-deficit conditions (regular irrigation) depending on the Stage or to the non-deficit (wet soils) irrigation regime (for all stages).

The non-deficit (wet soils) irrigation regime utilises existing infrastructure of the regular irrigation (dry soils) irrigation regime but applies up to 20 mm of wastewater to land when storage is unavailable/at capacity, irrespective of soil moisture conditions (i.e. likely when the soil is already wet). This system will be on the rapid permeability sand dunes and will facilitate drainage.

It is proposed that irrigation mains and hydrants are installed along fence lines enabling moveable pods and fixed sprinkler irrigators to irrigate as much of the Site as financially possible (which may see more than the minimum installed).

Buffer distances of 20 m from sensitive receptors or environments (Porangahau River) and 5 m from property boundaries (and a separate buffer of 150 m from any dwellings) will also be incorporated into the wastewater irrigation layout design. There is potential that fencelines may be moved as part of the site development and as directed by the property owners.

The wastewater irrigation system will utilise a low rate of irrigation system using impact sprinklers delivering between 3 and 9 mm/hr. They are expected to have a low production of aerosols with particle sizes no greater than 200 µm in size.

The infrastructure for the land application system will include the following key components:

- Storage pond and pumping system at the newly constructed Porangahau and Te Paerahi WWTP located at the discharge Site for Stage 3;
- Irrigation system, enabling irrigation of a minimum 40 ha by small moveable pods and fixed sprinklers;
- Conveyance pipelines from the Porangahau and Te Paerahi communities to the new WWTP and storage pond, and then to the irrigation system.

- Conveyance to a non-deficit (wet soils) irrigation system.

The visual impact of these components is in keeping with the rural environment, existing infrastructure and equipment used on neighbouring farms.

# 9 CONSTRUCTION AND ESTABLISHMENT

## 9.1 Design Features

Specific design features are proposed to ensure the irrigation system and its operation do not have adverse effects. In particular, attention has been paid to the investigations to date to ensure that a system is fit for purpose and irrigated areas and associated infrastructure avoid areas of significance or higher risk at compromising known values that should be protected.

As stated in Section 7 above, the irrigation will consist of low rate irrigation methods delivering an application rate of less than 10 mm/hr.

## 9.2 Earthworks

No recontouring (bulk earthworks) for irrigation purposes is proposed. The method of irrigation allows for flexibility to ascend and descend slopes of the central sand dunes.

Irrigation earthworks will involve trenching or directional drilling to install piping. Trenches, where required will be typically 0.6 m wide and up to 1.2 m deep.

While design and dimensions are not yet confirmed, a new storage pond, as well as a new WWTP servicing both communities is to be constructed. The location of these features is outlined in Figure 4.2. Any consenting for these facilities will be completed at the time of design, noting that design may be influenced by the outcome of the discharge consents.

All earthworks will require the preparation of a Construction Management Plan (CMP) and an Erosion and Sedimentation Control Plan (ESCP). These plans will detail construction methodology and how construction related effects will be managed.

## 9.3 Staging

The development and implementation of the **Project** will be in a series of Stages. These stages are detailed below in Table 8.1 along with an overview of the works involved:

**Table 8.1: Implementation of the Porangahau and Te Paerahi WWTP Project**

| Activity | Description | **Timing** *within date of consent being granted |
|---|---|---|
| **Resource Consenting** | • HBRC consents; and<br>• CHBDC consents as required. | |
| **Detailed Design** | • Determine irrigation design;<br>• Determine wet well, pump station and UV design; and<br>• Monitoring and management plans. | 6 months |
| **Detailed Design** | • Determine storage pond design;<br>• Construction management plans;<br>• Sediment and erosion control plans; and<br>• Design of pipeline from Te Paerahi to Discharge Property. | 12 months |
| **WWTP Pumping** | • Installation of a pump wet well;<br>• Installation of irrigation pump system and controls;<br>• Installation of UV system at both WWTPs;<br>• Construction of pipeline from Te Paerahi to Discharge Property. | 12 months |
| **Tendering and Irrigation Installation** | • Preparation of tender documents;<br>• Letting of contracts;<br>• Installation of irrigation rising main;<br>• Installation of irrigation laterals and sprinklers for Stage 1; and<br>• Design of pipeline from Porangahau to Discharge Property. | 12 months |
| **Tendering and Irrigation Installation** | • Installation of irrigation laterals and sprinklers for Stage 2.<br>• Construction of pipeline from Porangahau to Discharge Property. | 24 months |
| **WWTP Storage (Stage 3)** | • Preparation of tender documents;<br>• Letting of contracts;<br>• Modify pond wall as needed to create design storage volume;<br>• replace wave bands;<br>• modify metering and telemetry as needed; and<br>• Installation of irrigation laterals and sprinklers for Stage 3. | 24 months |
| **WWTP Construction (Stage 3)** | • Preparation of tender documents;<br>• Letting of contracts;<br>• Construction of new storage pond; and<br>• Construction of new WWTP. | 36 months |

# 10 SUMMARY AND CONCLUSIONS

The intention of the design concept is to develop a reasonable and appropriate discharge regime which considers and incorporates the social, cultural, environmental and economic needs of Porangahau and Te Paerahi, as well as the wider Central Hawke's Bay community. The system needs to be able to be sustainably operated for the foreseeable future, both in terms of the treatment of wastewater, and in terms of ensuring that the integrity of the land is not compromised by long term, repeated application of wastewater.

To address the social, cultural, environmental and economic needs of the community an extensive process of technical reporting and community consultations has been undertaken to identify:

- The available options for a long term discharge;
- Following identification of land discharge as the preferred option, a location for discharge; and
- A suitable discharge regime.

For Porangahau, the existing surface water discharge is believed to cause minor increases in nutrient and microbiological contaminant concentrations during median flow conditions, alongside moderate increases in nutrient and faecal coliform concentrations in exceedance of relevant guidelines during low flow conditions (Beca, 2020:P:B.24a). For Te Paerahi, environmental effects of the current discharge to dunes are expected to be negligible.

Both discharges are deemed to be culturally unacceptable by the communities and an alternative discharge environment needed to be identified with this being land. A land discharge regime and ceasing of the existing discharges is deemed to be acceptable by the communities.

The diligent management of the land, including the irrigation, is critical to achieve no more than minor adverse effects on the environment. The current landowners will manage the Site with a mixed cropping and grazing regime.

The development of the scheme has been divided into stages to enable progressive reduction in the discharge to the respective receiving environments, particularly the Porangahau River. Site investigations have determined that a combination of deferred/non-deficit and deficit irrigation depending on the underlying soil type is well suited to the Site. A summary of the characteristics for the conceptual design for each Stage is given in Section 7.11.

In summary, the discharge system is proposed to consist of the following components:

- 500 $m^3$ of storage, potentially as freeboard, at the Te Paerahi WWTP for Stage 1. Construction of a pipeline from Te Paerahi to the application site;
- 1,000 $m^3$ of storage between the Porangahau and Te Paerahi WWTPs for Stage 2. Construction of a pipeline from Porangahau to the application site;
- Construction of a new WWTP servicing Porangahau and Te Paerahi and an (up to) 35,000 $m^3$ storage pond for Stage 3.
- Irrigation pump station located at discharge Site built for Stage 1;
- A series of fixed and moveable impact sprinklers; and
- Wet well and pumping to:
    - 4 ha at Stage 1;
    - 6 ha (minimum) additional area at Stage 2; and
    - 30 ha (minimum) additional area at Stage 3.

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