17th December 2014

To: Kathy Dever-Tod
Manager Assets Group
Tararua District Council

**Technical Memo**

**Pahiatua wastewater treatment plant discharge to water**

**Summary of assessment of effects on water quality**

## 1 Context

Tararua District Council (TDC) are applying for resource consents associated with the operation and maintenance of its Pahiatua wastewater treatment plant (WWTP).

A technical assessment of environmental effects on water quality and aquatic ecology was prepared in July 2014 by Dr Neale Hudson, then of Opus International Consultants[1]. I have reviewed this report. For brevity I will thereafter refer to it as the Opus Report.

The purpose of this memo is to summarise key findings of the Opus Report, and, where relevant and possible, provide additional clarification on to the effects of the discharge in relation to relevant statutory provisions. In particular, I have used the information contained in the Opus Report to provide a technical assessment against water quality provisions of S107(1) of the Resource Management Act (1991), the National Policy Statement for Freshwater Management (NPSFM) (2014) and the Horizons Regional Policy Statement/ Regional Plan ('One Plan') water quality targets. Where necessary, and as identified in this memo, I have undertaken additional data analysis.

Whilst the Opus report includes considerations and analysis relative to the broader Mangatainoka River catchment, I have concentrated my assessment on the effects of the discharge itself (i.e. upstream/downstream comparisons).

The treated wastewater from the Pahiatua WWTP is currently discharged to Town Creek, a small tributary of the Mangatainoka River. It is my understanding that the resource consent applications by TDC involve the direct discharge of the treated wastewater to the Mangatainoka via an old intra-gravel water abstraction gallery. For this reason, my assessment focusses on effects on the Mangatainoka River, not on Town Creek.

[1] Opus International Consultants (2014) Pahiatua wastewater treatment plant consent renewal: Assessment of Environmental Effects

# 2 RMA S107(1)

## 2.1 S107(1)d – Conspicuous changes in water clarity or colour

Effects on water clarity are assessed in Sections 3.2.3 (p27) and 4.3 (p71) of the Opus Report.

I also undertook some further data analysis, in particular comparing upstream and downstream visual clarity using a statistical test[2] generally considered appropriate[3] for this type of situation. This analysis does not indicate statistically significant changes in visual water clarity between upstream and downstream of the discharge.

Reductions in water clarity of more than 20% were measured on 5 out of 27 monitoring occasions (19%), and reductions of more than 30% on 4 out of 27 occasions (15%) (Figure 1). Three of these were measured in 2010, and one in 2012. Unfortunately, there are no visual clarity data for 2013. Most people are able to detect a change in water clarity of 30% or more.

Effluent quality data indicates that unusually elevated Total Suspended Solids (TSS) concentrations occurred during January to April 2010 (concentrations of 80-110 mg/L against a long-term median of 10 mg/L), suggesting that the discharge was probably the cause of, or a contributor to, the changes in water clarity during these months. The November 2012 change in water clarity was however not associated with elevated TSS concentrations in the discharge (8 mg/L), and it is doubtful whether the discharge was the cause of the decrease in visual clarity measured that day. TSS concentrations in the effluent have been consistently low (<20 mg/L) since January 2012, indicating that the current discharge presents a low risk of causing significant changes in water clarity or colour.

My conclusion is that the discharge does not appear to cause significant changes in water clarity overall, although conspicuous changes in water clarity have occurred on occasion during three consecutive months in 2010. The current discharge quality presents a low risk of causing significant changes in water clarity or colour.

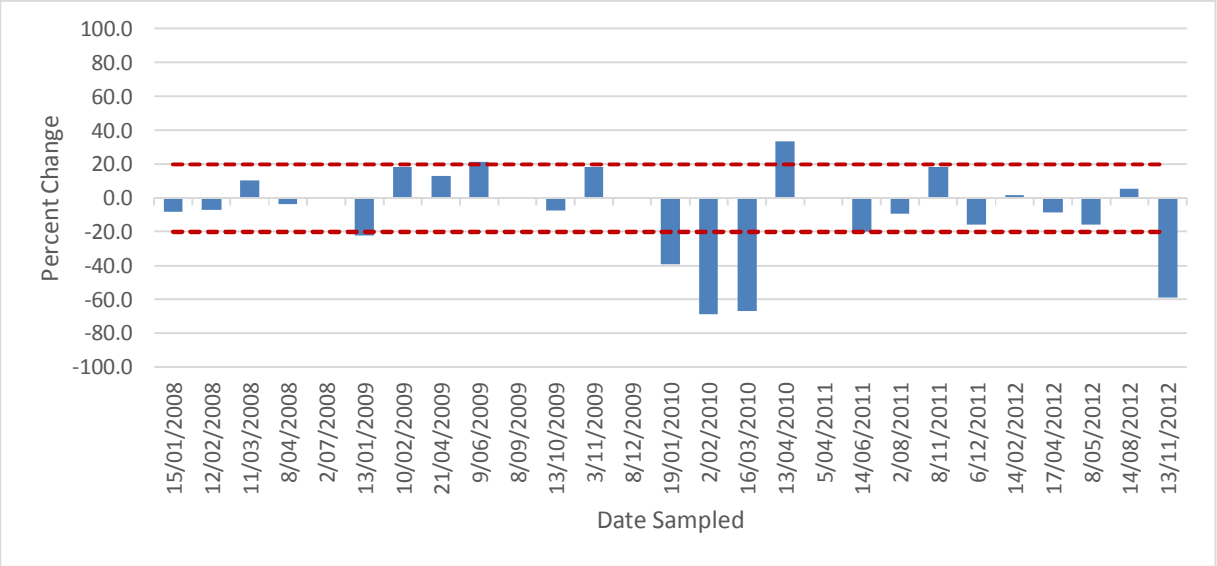


**Figure 1: Relative change in visual water clarity in the Mangatainoka River between upstream and downstream of the Pahiatua WWTP discharge (Data source Horizons Regional Council, data from Jan 2008 to Dec 2012).**

[2]Wilcoxon Pairwise comparison

[3] As recommended in Scarsbrook M. and McBride G (2007). Best practice guidelines for the statistical analysis of freshwater quality data. Prepared for the Ministry for the Environment by the National Institute for Water and Atmospheric Research (NIWA). NIWA client report: HAM2007-088.

### 2.2 S107(1)(f) – the rendering of freshwater unsuitable for consumption by farm animals.

There are a range of contaminants relevant to stock drinking water, including pathogens/microbiological water quality, toxicants, and physico-chemical characteristics such as pH.

I comment on aspects relative to microbiological water quality in Section 4.3 of this memo.

I have also reviewed available data relative to total ammonia-nitrogen and nitrate-nitrogen. My conclusion is that the discharge does not cause the stock drinking water guidelines relative to these determinands to be exceeded downstream of the discharge.

I have no information on the discharge content of other water quality determinands relevant to stock drinking standards, such as for example metals, but, based on my experience of a number of other similar WWTPs across the region and in neighbouring regions, I have no reason to believe that these would be present in sufficient concentrations in the discharge to be of significant environmental concern after reasonable mixing.

In conclusion, what information is available indicates that the discharge meets the requirements of S1007(1)(f).

### 2.3 S107(1)(g) - Effects on aquatic life

The Opus Report makes an assessment of the effects of the discharge on the life-supporting capacity of the Mangatainoka River (pp74-75). It considers a range of water quality determinands such as water pH, temperature, dissolved oxygen concentrations, and uses indices of macro-invertebrate community health as a direct measure of life-supporting capacity. With regards to the latter, the report concludes that there is little indication that the discharge exerts a deleterious impact on life-supporting capacity. Having reviewed the data presented in the Opus Report, I concur with this conclusion.

The Opus report indicates that the discharge does not alter the temperature of the Mangatainoka River measurably, and that pH appears to respond generally in the lower catchment rather than in response to the discharge itself. I generally concur with these conclusions.

With regards to dissolved oxygen (DO), there is a slight, but statistically significant, decrease in DO saturation downstream of the discharge. All DO measurements upstream and downstream of the discharge are well above 5 mg/L and all but one measurement downstream of the discharge are above 80% saturation. On this basis there does not appear to be an indication of significant deleterious effects of the discharge on DO levels in the Mangatainoka. It should be noted however that spot measurements of DO are of limited value, and continuous DO measurements are generally preferable and would be advisable if there was an indication of significant risk of effects on DO concentration or saturation in the Mangatainoka River.

The Opus Report also provides an assessment relative to two toxic contaminants, ammonia and nitrate (pp73-74). The report concludes that:

a. the discharge does not cause any measurable total ammonia-N concentration increase in the Mangatainoka River downstream of the discharge[4], and
b. free ammonia-N concentrations are approximately 10 times lower than the 95% protection species
c. The nitrate-nitrogen concentrations in the discharge are well below toxicity thresholds, indicating that the discharge is not a source of nitrate-nitrogen in amounts likely to constitute a toxicity hazard, and that river nitrate-N concentrations are well below both toxicity thresholds.

On the basis of the above information, my conclusion is that the discharge does not appear to be causing any significant adverse effect on aquatic life, or to be causing more than a low risk of toxic effects to aquatic life.

[4] I note that my own analysis shows that there is a small, but statistically significant increase in total ammonia-N concentrations downstream of the discharge.

## 3 NPSFM (2014)

The assessment below is limited to a technical assessment against the relevant "Attribute tables" contained in Appendix 2 of the NPSFM (2014), specifically the following attributes, relevant to rivers: Periphyton (Trophic State), Nitrate (toxicity), Ammonia (Toxicity), and *E.coli*. I was not able to provide an assessment tin relation to the Dissolved Oxygen (below point sources) Attribute, as it requires continuous dissolved oxygen data. I have made enquiries with Horizons regarding the availability of such data.

The NPSFM (2014) attribute tables are based on four "Bands" with Band A representing the best attribute state, and Band D the worst. The threshold between Band C and Band D constitutes the "national bottom line".

The key output of my assessment presented below is to provide a "grading" assessment for the Mangatainoka River upstream and downstream of the discharge for each Attribute, as presented in Table 1 below.

There is no difference in grading between upstream and downstream of the discharge in relation to periphyton biomass, nitrate (annual median concentration), ammonia (annual median concentration) and *E. coli*.

There is a shift from band A to band B between upstream and downstream of the discharge in relation to peak (95$^{th}$ percentile) nitrate-nitrogen concentrations. Some growth effects to up to 5% of species may occur within Band B. I note however that under a worst-case scenario[5], the discharge has the potential to increase nitrate concentrations in the Mangatainoka River by up to 0.020 to 0.026 mg/L (based on median and 95$^{th}$ percentile effluent concentrations), and it thus seems unlikely that the discharge would be the sole cause of the shift from Band A to Band B. Grading for the downstream site in 2013 is A.

Similarly, the grading for annual maximum ammonia concentration shifts from Band A upstream of the discharge to Band C downstream of the discharge. This is due to relatively elevated total ammonia-N concentrations recorded downstream of the discharge on two occasions in March and June 2011 (1.8 and 1.4 mg/L respectively) and one occasion in February 2012 (0.57 mg/L). Grading for the downstream site in 2013 is A.

[5] River at Mean Annual Low Flow (MALF), wet weather discharge rate of 16l/s

**Table 1: Grading assessment of the Mangatainoka River upstream and downstream of the Pahiatua wastewater discharge for River Attributes, as per Appendix 2 of the NPSFM (2014). (Data Source, Horizons regional Council, Jan 2008-Dec2013)**

| Attribute | Attribute state (2008-2013 data) | | Narrative description |
|---|---|---|---|
| | Upstream | Downstream | |
| Periphyton biomass | B | B | A: Rare blooms reflecting negligible enrichment and/or alteration of the natural flow regime or habitat<br>B: Occasional blooms reflecting low nutrient enrichment and/ or alteration of the natural flow regime or habitat<br>C: Periodic short-duration nuisance blooms reflecting moderate nutrient enrichment and/or alteration of the natural flow regime or habitat<br>D: Regular and/or extended-duration nuisance blooms reflecting high nutrient enrichment and/or significant alteration of the natural flow regime or habitat |
| Nitrate-N (Annual median) | A | A | A: High conservation value system. Unlikely to be effects even on sensitive species.<br>B:Some growth effects on up to 5% of species<br>C: Growth effects on up to 20% of species (mainly sensitive species such as fish)<br>D: Impacts on growth of multiple species, and starts approaching acute impact level (ie risk of death) for sensitive species at higher concentrations (>20 mg/L) |
| Nitrate-N (Annual 95th percentile) | A | B | |
| Ammonia (Annual median) | A | A | A: 99% species protection level: No observed effect on any species tested<br>B: 95% species protection level: Starts impacting occasionally on the 5% most sensitive species<br>C: 80% species protection level: Starts impacting regularly on the 20% most sensitive species (reduced survival of most sensitive species<br>D: Starts approaching acute impact level (ie risk of death) for sensitive species |
| Ammonia (Annual Maximum) | A | C | |
| *E. coli* Annual Median | A | A | A: People are exposed to a very low risk of infection (less than 0.1% risk) from contact with water during activities with occasional immersion and some ingestion of water (such as wading and boating)<br>B: People are exposed to a low risk of infection (less than 1% risk) from contact with water during activities with occasional immersion and some ingestion of water (such as wading and boating).<br>C: People are exposed to a moderate risk of infection (less than 5% risk) from contact with water during activities with occasional immersion and some ingestion of water (such as wading and boating). People are exposed to a high risk of infection (greater than 5% risk) from contact with water during activities likely to involve immersion.<br>D: People are exposed to a high risk of infection (greater than 5% risk) from contact with water during activities with occasional immersion and some ingestion of water (such as wading and boating). |
| *E. coli* (95th percentile) | Below B[(a)] | Below B | A: People are exposed to a low risk of infection (up to 1% risk) when undertaking activities likely to involve full immersion.<br>B: People are exposed to a moderate risk of infection (less than 5% risk) when undertaking activities likely to involve full immersion. 540 / 100ml is the minimum acceptable state for activities likely to involve full immersion. |

(a): The grading system only includes 95th percentile statistics in bands A and B (95th percentile of < 206 and 540 *E. coli*/100mL respectively). The 95th percentile statistic exceeds 540/100mL at both upstream and downstream sites.

# 4 One Plan water quality targets

The One Plan water quality targets applicable to the Mangatainoka River at the point of discharge are reported on p21 of the Opus report and are not repeated here.

## 4.1 Water pH and temperature

The effects of the discharge on water pH and temperature are assessed in pp22 to 26 of the Opus Report. The key conclusions with regards to these determinands is that the discharge does not alter the temperature of the Mangatainoka River measurably, and that the pH response occurs generally in the lower catchment, rather than in response to the wastewater discharge specifically.

Non-parametric pairwise testing (Wilcoxon test) does not indicate any overall significant differences between upstream and downstream of the discharge.

On this basis, I conclude that the effects of the discharge on water pH and temperature in the Mangatainoka River are no more than minor.

## 4.2 Visual water clarity

The effects of the discharge on water clarity are assessed at Section 2.1 of this report.

## 4.3 Microbiological water quality

With regards to microbiological water quality, the Opus report concludes that "after 2010, however, the median wastewater discharge concentration was generally less than the target for the river". It also notes that although the concentration of *E. coli* in the discharge has decreased over time, the number of exceedances of the HRC water quality targets in the river downstream of the discharge has not decreased to the same extent.

I have carefully reviewed the data available, and have reached the following conclusions;

- I concur with the Opus Report that treated wastewater quality has improved markedly since 2010. The median and 95$^{th}$ percentile *E. coli* concentrations in the treated effluent for the period 2010-2013 are 4 /100 mL and 1,716 /100 mL respectively, indicating an excellent level of treatment. Median and 95$^{th}$ percentile concentrations during the 2008-2009 period were 74,200 and 367,000 *E. coli*/100mL respectively;
- Assuming a worst-case dilution scenario (river at MALF, wet weather discharge of 16l/s), the above current discharge quality has the potential to raise the in-stream *E. coli* concentration by 0.04 *E. coli*/100mL as a median and 17 *E. coli*/100mL as a 95$^{th}$ percentile. I consider these concentration increases are unlikely to be able to be detected against the existing background (upstream) concentrations;
- Based on these figures, it appears unlikely that the discharge would be able to cause any measurable changes in the *E. coli* concentrations in the Mangatainoka River after reasonable mixing, apart from exceptional circumstances;
- However, there is a statistically significant[6] increase in *E. coli* concentration downstream of the discharge, compared with upstream, leading to slightly more exceedances of the One Plan water quality targets at the downstream site than at the upstream site (Table 2);
- There appeared to be no improvement in the level of compliance with the One Plan targets downstream of the discharge when comparing the 2010-2013 period against the 2008-2009 period. This finding also concurs with that of the Opus Report;
- Given the effluent quality measured since 2010, the discharge does not appear to be able to give rise to the concentration increases measured between the upstream and the downstream site during that period;
- Based on the above findings, it appears likely that the changes in microbiological water quality measured between upstream and downstream of the discharge are influenced, at least in part, by sources other than the discharge of treated wastewater itself. This conclusion is again consistent

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with that of the Opus Report. It is possible that source of faecal contamination may be present in Town Creek upstream of the discharge point from the Pahiatua WWTP. I am however not aware of any existing data to assess whether this hypothesis is correct.

**Table 2: Summary of *E. coli* concentrations and compliance with the One Plan water quality targets in the treated discharge from the Pahiatua WWTP and in the Mangatainoka River upstream and downstream of the discharge.**

| | 2008-2009 period | | | 2010-2013 period | | |
|---|---|---|---|---|---|---|
| | Discharge | Upstr. | Downstr. | Discharge | Upstr. | Downstr. |
| Median (*E. coli*/100mL) | 74,200 | 90 | 99 | 4.0 | 105 | 154 |
| 95th percentile ( /100mL) | 367,000 | 739 | 473 | 1,716 | 702 | 2,263 |
| % compliance with 550 E.coli/100ml at flows below 20th FEP | N/A | 93% | 93% | N/A | 92% | 86% |
| % compliance with 260 *E. coli*/100ml at flows below median | N/A | 82% | 82% | N/A | 76% | 62% |

### 4.4 Nutrients (DRP and SIN) and periphyton

With regards to Soluble Inorganic Nitrogen (SIN), the Opus Report concludes that the One Plan targets are largely exceeded both upstream and downstream of the discharge, and that the discharge does not result in any practically important differences in concentrations between upstream and downstream of the discharge (using formal equivalence testing).

This is in agreement with my own analysis using a different statistical method (Wilcoxon test).

In short, the discharge does not appear to cause a more than minor effect on in-stream SIN concentrations, although it should be noted that this is against a background of elevated SIN concentrations upstream of the discharge, making the statistical detection of changes caused by the discharge less likely.

With regards to Dissolved Reactive Phosphorus (DRP), the Opus Report concludes that downstream DRP concentrations are greater than upstream, but that the difference is not practically important, again using a formal equivalence testing. My own analysis (using a Wilcoxon test) confirms that the difference between upstream and downstream concentrations is statistically significant.

With regards to periphyton growth, the Opus report concludes that:

- N:P ratios are generally elevated both upstream and downstream of the discharge; and
- the Pahiatua WWTP discharge is exerting a mild stimulatory effect on periphyton growth.

The report does not however provide a clear assessment of how periphyton biomass and cover compare with the One Plan targets upstream and downstream of the discharge. I have thus undertaken my own analysis of the data provided by Horizons and my conclusions are as follows:

- As reported in the Opus report, there has been an improvement in the quality of the discharge since 2010. I have thus analysed the 2008-2009 and the 2010-2013 periods separately. This is consistent with the analysis I conducted for *E. coli*;
- The periphyton biomass target is generally met both upstream and downstream of the discharge, but with a slight increase in the proportion of exceedances of the periphyton biomass target (from 8 to 9% during 2008-2009 and from 4% to 7% of samples during 2010-2013) (Table 3). It is noted that the difference is due to three samples exceeding the target downstream vs. two upstream, but with a third upstream sample just on 120 mg/m$^2$, i.e. only technically compliant;
- There appeared to be a significant increase in the number of observations exceeding 30% of cover by filamentous algae between upstream and downstream during the 2008-2009 period. However,

the level of compliance with the filamentous cover target has been similarly high both upstream and downstream of the discharge since 2010;
- The only exceedances of the target relative to % cover by thick mats were observed upstream of the discharge.

In conclusion, the discharge from the Pahiatua WWTP causes a moderate, but statistically significant, increase in DRP concentrations downstream of the discharge. It does not however appear to cause any significant changes in SIN concentrations.

It appears to cause a mild stimulatory effect on periphyton growth, which is to be expected given the indication of P-limited periphyton growth conditions indicated by the elevated N:P ratios. However, this mildly increased periphyton growth does not appear to be causing a material increase in the frequency of excessive (defined as exceedances of the One Plan targets) growths of biomass, long filamentous or thick mats downstream of the discharge.

**Table 3: Summary compliance with the One Plan water quality targets for periphyton biomass and cover the Pahiatua WWTP and in the Mangatainoka River upstream and downstream of the discharge.**

| | 2008-2009 period | | 2010-2013 period | |
|---|---|---|---|---|
| | Upstr. | Downstr. | Upstr. | Downstr. |
| Periphyton biomass<br>% compliance with 120 mg Chlo *a*/m$^2$ | 92% | 91% | 96% | 93% |
| Periphyton cover<br>% compliance with 30% cover by long filamentous algae | 85% | 46% | 98% | 98% |
| Periphyton cover<br>% compliance with 60% cover by thick mats | 92% | 100% | 100% | 100% |

### 4.1 Ammoniacal nitrogen

The One Plan sets two water quality targets relative to ammonia: an average concentration of 0.4 mg/L in relation to chronic (long-term exposure) toxic effects and a maximum concentration of 2.1 mg/L in relation to acute (short-term exposure) effects.

Existing monitoring data indicates that both targets are met both upstream and downstream of the discharge.

### 4.2 ScBOD$_5$ and POM

The effects of the discharge on ScBOD$_5$ and Particulate Organic matter (POM) are assessed in pp 36-37 of the Opus Report. Both determinands are indicative of the organic load/content of the discharge.

Having reviewed these sections of the report and the actual data, I am satisfied that the discharge complies with the One plan targets relative to these determinands.

### 4.3 Change in QMCI

I comment on the effects of the discharge on macroinvertebrate communities in Section 2.3. Based on data collected in 2013, the discharge appears to be causing a slight decrease in QMCI, but of less than 20%, i.e. compliant with the One Plan QMCI change target.

At the time of finalising this memo, I have only just received additional data from Horizons. A cursory look at the data indicates that there was a slight (4%) reduction in QMCI and a moderate (14%) increase in MCI between upstream and downstream, confirming the above conclusions. At the time of writing this memo, I have not been able to access the 2014 data.

## 5 Effects of the future discharge

I have reviewed and considered the findings of a draft technical memo relative to future Pahiatua WWTP upgrades prepared by Morgelyn Leizour, of Opus, dated 12 December 2014.

My understanding is that the following upgrades are proposed for the Pahiatua WWTP within the next few months (i.e. summer 2014-2015):

- Installation of an inlet primary screen, to remove gross solids;
- Installation of a lamella clarifier and drum filter, expected to result in reductions in the TSS, TN and DRP concentrations in the final effluent;
- Installation of a UV disinfection unit, resulting in a reduction in the concentration of pathogens in the discharge.

It is however my understanding that the actual quality of the treated effluent discharged to the Mangatainoka River remains somewhat uncertain, and the memo recommends that it be confirmed by detailed monitoring following the commissioning of the upgrades.

On this basis I am only able to comment on the likely effects of the proposed upgrades on a qualitative (as opposed to quantitative) basis. A fully quantitative assessment can be prepared once the quality of the treated discharge has been confirmed.

- With regards to microbiological water quality, I describe the effects of the discharge in Section 4.3. UV disinfection will further reduce the effects of the discharge on the Mangatainoka River's microbiological water quality;
- I describe the current effects of the discharge on visual water clarity in Section 2.1. The installation of a lamella clarifier and drum filter will reduce the concentration of TSS in the discharge, resulting in a reduction (compared with the current low risk) in the risk of the discharge causing effects on water clarity and colour. I note that the proposed discharge via an exfiltration gallery may also provide an additional degree of filtration.
- With regards to nutrients, the proposed upgrades are predicted to result in a reduction in the concentration of both the DRP and nitrogen content of the discharge. Currently, the discharge appears to be causing a mild stimulatory effect on periphyton growth. Based on nutrient ratios, it appears likely that the phosphorus content of the discharge is the primary driver of this effect. Qualitatively, I consider it likely that the predicted reductions in nitrogen and phosphorus content of the discharge will result in a reduction in the effects of the discharge on periphyton growth. These effects are currently measurable but within the one Plan targets. I expect that the effects of the future discharge will also be within the One Plan targets;
- Lastly, based on the data I have reviewed, the effects of the discharge on macroinvertebrate communities also appear to be within the One Plan targets. Given the predicted improvements in discharge quality, I expect this will remain the case after the proposed upgrades.

Dated 17 December 2014

Olivier Ausseil (PhD)
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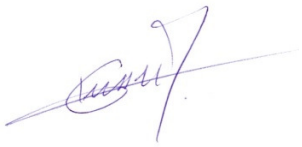
Aquanet Consulting Ltd



Rangitāne o Tamaki nui a Rua Inc

# CULTURAL VALUES ASSESSMENT
# for
# WOODVILLE SEWAGE TREATMENT PLANT
# &
# PAHIATUA SEWAGE TREATMENT PLANT

Peter McBurney
Auckland
November 2014

*A Report Commissioned by*
*Rangitāne O Tāmaki nui a Rua*

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# Preface

## The Author

My name is Peter James McBurney. I am a Pākehā New Zealander of Irish and English descent. I was born in Ōtāhuhu and grew up in Mangere Bridge, South Auckland. In 1994, I completed a Bachelor of Arts degree at the University of Auckland, specializing in anthropology, Maori studies and history. Since December 1994, I have worked as a freelance historian, predominantly under contract to the Crown Forestry Rental Trust and its clients, but also (and increasingly) for the Office of Treaty Settlements and directly for Iwi. This work has included researching and writing histories of land blocks, mana whenua (tribal traditional history), regional public works affecting Māori-owned land and other specialised reports.

These reports cover a wide range of claim-related issues spanning all periods of New Zealand/Aotearoa's colonial history, including public works takings of Maori land, the operation of the Native Land Court, the New Zealand Land Wars, legal challenges of the colonial regime undertaken by Maori, and the development of Maori organisations aimed at promoting Maori autonomy and self-determination. Between 2000 and 2002 I completed a series of reports for Rangitāne O Tāmaki Nui A Rua, and the Waitangi Tribunal's Wairarapa ki Tararua Inquiry focused on the Crown's acquisition of land in the district during the nineteenth century. I also produced a Cultural Values Assessment for Rangitāne o Tamaki nui a Rua in June 2009 on the Turitea Wind Farm Site.

Although they are often supplemented by interviews with kaumātua and other tribal experts, the reports are primarily based on archival research. I have presented evidence before the Waitangi Tribunal on eleven occasions.

I live in Auckland with my partner Kate Hill, who is an archaeologist, artist and historian.

## Acknowledgements

I would like to acknowledge and thank the following people, who have assisted with the preparation of this CVA report.

Rangitāne kaumātua Manahi Paewai and Hanatia Palmer gave up their time and shared their knowledge in interviews for this project. Mr Paewai has provided additional feedback regarding the traditions and whakapapa of hapū of Rangitāne o Tamaki nui a Rua.

Hineirirangi Carberry, RMA Officer for Rangitāne O Tamaki nui a Rua has managed the project from the outset, arranging hui and providing much of the research material used in preparing the CVA. Mrs Carberry arranged meetings with Tararua District Council staff on site at the sewage treatment facilities and accompanied me on those visits. Mrs Carberry has also co-ordinated the provision of feedback from kaumātua and other contributors on early drafts of the CVA.

On that occasion, Mr Dave Watson (Utilities Manager) and Mr Eric Bonny (Utilities Engineer) of the Tararua District Council gave me a thorough introduction to the operations of the sewage treatment plants at Woodville and Pahiatua. Mr Bonny and Mr Watson have since provided feedback on a passage from an early draft of this CVA dealing with the treatment process employed at the Woodville and Pahiatua STPs.

Ngā mihi nui ki a koutou.

Each of these people has made valuable contributions to the project; however, as author of this CVA report, I am responsible for any errors it may contain.

Peter McBurney

November 2014

## The Commission/Project Brief

This Cultural Values Assessment was commissioned by Rangitāne O Tamaki nui a Rua relating to applications lodged by the Tararua District Council, which is seeking to renew existing consents under the Resource Management Act 1991 for the Woodville Sewage Treatment Plant and the Pahiatua Sewage Treatment Plant.

The CVA will incorporate information obtained from archival and other sources, including Native Land Court block minutes and related documentation, and reports produced to support Treaty of Waitangi claims, in order to illustrate the traditional relationship of Rangitāne O Tamaki nui a Rua to the Ahuatūranga and Manawatū-Wairarapa Nos 2, 2A, 2B and Ngātapu No. 1 Blocks. The CVA will focus on whakapapa and narrative traditions, with a particular focus on the following:

1. Tribal Origins
2. Hapū origins –areas of Mana whenua
3. Sites of significance
4. Wāhi Tapū
5. Urupa
6. Pa sites
7. Maunga
8. Awa
9. Resource gathering areas
10. Battle sites
11. Flora and Fauna

The author understands that at the time of writing, only the application for the renewal of the consent for the Woodville STP has been lodged, but the Pahiatua STP also requires a new consent which Tararua District Council is working on at present; hence this CVA is required to assess the interests of Rangitāne O Tamaki nui a Rua regarding both the Woodville and the Pahiatua STP sites.

## Synopsis

This Cultural Values Assessment (CVA) is divided into four sections, which can be summed up as addressing: Rangitāne Mana Whenua in Ancient Times, Mana Whenua Today, Legal Rights and Obligations – the RMA, and Issues Arising from the Consent Application for the Woodville Sewage Treatment Plant and the projected Consent Application for the Pahiatua Sewage Treatment Plant (STP).

### Mana Whenua

Part 1 begins with a brief description of the land and waterways over which Rangitāne O Tamaki nui a Rua hold mana whenua or customary interests which includes the sites of the Woodville and Pahiatua Sewage Treatment Plants. There follows an account of Rangitāne traditions from ancient times illustrated by appropriate whakapapa (genealogy) charts demonstrating the iwi's longstanding association with the land. This is followed by a detailed review of the traditions relating to the three hapū whose rohe is most affected by the Woodville and Pahiatua STPs (Ngāti Mutuahi, Ngāti Te Koro and Ngāi Te Kapuārangi), with the aim of clearly demonstrating how these hapū came to be recognised as the holders of mana whenua in these localities.

The CVA then gives a brief account of the post-1840 history of the Tararua District from the perspective of Rangitāne focusing on the process by which chiefs of Rangitāne hapū dealt with Crown agents and how those dealings led inexorably to the alienation of the greater part of Rangitāne land holdings. Particular attention is given to the alienation of the blocks upon which the Woodville and Pahiatua STPs are located. Part 1 closes with a short excerpt from a recent report by the Waitangi Tribunal on the Māori conception of territory and a summary of some of the key concepts that form the basis of the relationship of Māori to the environment.

### Mana Whenua Today

Part 2 sets out a brief history of Te Kāuru Hapū Collective as a body representing tangata whenua groups (hapū) affiliated to Rangitāne O Tamaki nui a Rua (and other iwi) in their dealings with local authorities and government agencies, particularly Horizons Regional Council and Tararua District Council. A strategic planning document designed to develop and implement a management plan for the Manawatū River and its tributary systems from a tikanga Māori perspective is outlined.

**Legal Rights & Obligations – the RMA**

In Part 3, the CVA looks at the Resource Management Act 1991 and the protections it affords the cultural values of Māori hapū and iwi and the guidelines it provides for a productive working relationship between Māori and the Crown when dealing with the environment. In terms of the consent application for the Woodville STP and projected consent application for the Pahiatua STP, the place of the Crown is taken by two local authorities to whom the Crown has delegated its governorship (kāwanatanga) responsibilities and, correspondingly, its obligations under the Treaty of Waitangi.

**Consent Applications for the Woodville and Pahiatua STPs**

Part 4 looks at the specific cases of the Woodville and Pahiatua STPs, and their effects on the environment from a Māori (and specifically Rangitāne) cultural perspective.

# Mana Whenua

## 1 Mana whenua of Rangitāne O Tamaki nui a Rua

### 1.1 Whenua

The rohe (territory) of Rangitāne O Tamaki nui a Rua closely coincides with the present-day boundaries of the Tararua District **(refer Appendix 2, B1.1 for Boundary Map)**. The District Council was established in the late 1980s, and the 'Tararua' designation has the advantage of unifying a district that was for many years divided by the old provincial boundary between Wellington and Hawke's Bay. On the other hand, the name 'Tararua' is not entirely accurate, as the northern portion of the district lies adjacent to the Ruahine Range, not the Tararua. During the early period of Māori settlement, the area from the southern edge of the Takapau Plains in the north to Ōpaki (a natural clearing just north of present day Masterton) in the south, was known as Te Tāpere Nui o Whātonga – literally the great district (food supply for the Chief) of Whātonga.[1] A portion of this area from the Mt Bruce/Eketāhuna area to Norsewood was known as Tamaki nui a Rua (often shortened to Tamaki) and is used still by local Māori to describe the area.

The "Tamaki nui a Rua Land Alienation Overview Report", produced by this author in 2002, describes the boundaries of the Rangitāne rohe as follows:

> Following block boundaries, the perimeter of the rohe may be described as follows: beginning at Poroporo on the coast about 5 kilometres north of Cape Turnagain, the line follows the coast southwards about 38 kilometres to the Mataikona River mouth, it then follows the Mataikona River and its tributaries, the Pakowhai River and Makoura Stream inland to the high point named Table (479 metres), then to Tiraumea and eastwards, following the Tiraumea Stream, to the 'trig' at Timahanga. It then turns southwards past Alfredton, following the Ihuraua Stream past Ihuraua and on to Dreyer's Rock, just east of Mauriceville. Still heading west, and leaving Mauriceville to the south, the boundary skirts around the southern side of Mount Bruce (710 metres) then heads north-westwards to the top of the Tararua dividing range at about Mt Dundas (1,499.4 metres). The boundary then follows the centre of the dividing range northwards (north-north-east) to the Manawatū Gorge where, as part of the Ahuaturanga block, it briefly enters the Gorge heading west, before returning to follow a nor-nor-easterly line slightly to the west of the peaks of the Ruahines to the north-western corner of the Ngamoko (Manawatū No. 5) block, just to the west of the high point marked 88A Toka (1,519.1 metres). According to the Theophilus Heale Triangulation Sheet of 1875, the Maharahara, Tamaki, Umutaoroa, Piripiri, Te Ohu and Ngamoko blocks all extend over to the western side of the Ruahine

[1] Buick, *Old Manawatu* , p. 18.

> Range.[2] From there the line then strikes south-east, following the course of the young Manawatū River along the northern boundary of Ngamoko, leaving Norsewood to the south and past the old river ford at Te Whiti on the northern boundary of the Tuatua block, before traversing the north-eastern boundaries of the Waikopiro, Wharawhara and Ngapaeruru blocks, of which the latter veers southwards to strike the Tautane block boundary at Te Kahakaha. The perimeter boundary then follows the northern boundary of the Tautane block to the sea at Poroporo at the commencement....The area has been roughly calculated as containing 423,879.29 ha, which equates to approximately 1,047,448 acres.[3]

This CVA is concerned with the awa, or river systems contained within this rohe, particularly those most affected by the Woodville and Pahiatua STPs.

## 1.2 Awa

Draining a catchment area of 594,661 hectares, the Manawatū River rises in the eastern Ruahine Range north west of the settlement of Norsewood. Fed by numerous tributaries, it first flows eastward before turning south-west near Ormondville, flowing on for 40 kilometres before turning north-west near Woodville. It then turns abruptly westwards to flow through the Manawatū Gorge and thence south-westwards to the sea in the south Taranaki Bight.

A confluence of major tributaries occurs south of the town of Woodville where the Mangatainoka and Tiraumea Rivers join the Manawatū at Ngaawapurua.[4] The Mangahao River meets the Manawatū a little farther west. Together with their own complex tributary systems, which include the Mākakahi, the Mangaone and the Mākuri Rivers, these waterways drain a catchment of 171,198 hectares, comprising the southern part of the east coast inland lowlands, the west flank of the east coast highlands, and the east flank of the northern Tararua Range.[5] The 6 kilometre-long Manawatū Gorge, which divides the Tararua Range to the south from the Ruahine Range to the north, is known as both Te Āpiti (The Narrowing) and Te Aurere a Te Tonga (The Rushing Current of the South). Rangitāne traditions provide the following account of the origins of the gorge:

> Away in the dim past a huge totara tree growing on the slopes of the Puketoi Range in Hawke's Bay became possessed of a supernatural being called Okatia. Under the influence of the spirit the tree began to move, gouging out a deep channel towards the north-west. In time the moving tree encountered the

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[2] Triangulation Sheet No.5 by Theophilus Heale, Inspector of Surveys, Auckland, New Zealand, June 1875. Palmerston North Public Library, Archive Map M 22.

[3] McBurney, P., "Tamaki Nui a Rua Land Alienation Overview Report" (prepared for Waitangi Tribunal Inquiry Wai 863), CFRT, 2002, pp. 16-17.

[4] The Mangatainoka and Tiraumea Rivers join together before their confluence with the Manawatū River at Ngaawapurua, while the Mangahao meets the Manawatū a little farther west.

[5] 'Manawatu River', from An Encyclopaedia of New Zealand, edited by A. H. McLintock, originally published in 1966. Te Ara - the Encyclopedia of New Zealand, updated 22-Apr-09

> mountain barrier of Tararua and Ruahine, but this obstacle counted for nothing as the totara turned to the west and simply forced its way right through the mountains, thus creating the gorge. The tree then meandered across the plains until it entered the sea. This provided a convenient bed for the Manawatu River.[6]

A large sacred rock named Te Ahu-a-Tūranga standing in the middle of the gorge is named after Tūranga (or Tūranga-i-Mua), the son of Turi, the commander of the *Aotea* waka. Tūranga was an ancestor of Rangitāne from both sides of the ranges. The reddish colour of the rock is said to change in intensity if a prominent member of Rangitāne dies or blood is shed. Tāngata whenua recite karakia (incantations/ prayers) when passing the rock to propitiate the spirits and ensure safe travels through the gorge.[7] Mrs Hanatia Palmer, a kuia rangatira of Rangitāne O Tamaki nui a Rua, states that according to Rangitāne tradition, Tūranga of *Aotea* died at the gorge and his spirit became one with the great red rock in the gorge. The tradition has it that even when the river is in flood, the rock rises above the tide and is never covered. Mrs Palmer adds that the spirit of Tūranga was brought from the rock and instilled into Saint Andrews Anglican Church at Te Rangiotū, southwest of Palmerston North.[8] There are a number of intriguing accounts relating to the name of the rock. But all infer that it was a rock of cultural significance, which warned of impending danger if seen to be red to Rangitāne on both sides of the Rangers.

## 1.3 Early Rangitāne Traditions

Rangitāne, the eponymous ancestor of Rangitāne O Tamaki nui a Rua iwi was the grandson of Whatonga, who was himself the grandson of the great early navigator and explorer, Toi Te Huatahi (also known as Toi Kairākau). Local Hawke's Bay historian Patrick Parsons states:

> Whatonga...arrived in Aotearoa aboard the *Kurahaupo* canoe, landing at Nukutaurua on Mahia peninsula. Accompanying him were the chiefs Ruatea and Popoto. He subsequently made his way down into Hawke's Bay where he established a settlement on the coast at Te Awanga. There he built a house of note called Heretaunga, a name by which the wider district is still known today.[9]

Following a disagreement with his first wife, Whatonga travelled south to Cape Palliser and Wellington Harbour (later named "Te Whanganui a Tara" after Whatonga's eldest son), then on to Te Tau Ihu O Te Waka A Maui (the Marlborough

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[6] McEwen, J. M., *Rangitāne: a tribal history*, Auckland, Reed Books, 1986, p. 1.

[7] Malcolm McKinnon. 'Manawatū and Horowhenua places - Manawatū River and Gorge', Te Ara - the Encyclopedia of New Zealand, updated 4-Jul-14

[8] Interview with Hanatia Palmer, Rangitāne o Tamaki nui a Rua Offices, Dannevirke, 21 August 2014.

[9] Parsons, Patrick, "Waitahora Wind Farm: Cultural Values Assessment", Commissioned by Rangitane O Tamaki Nui A Rua, February 2009, p. 2.

Sounds), before returning to Te Ika A Maui (the North Island) via the Kapiti coast. Arriving at the mouth of the Manawatū River, he followed its course north-eastwards to Te Ahu a Tūranga (the Manawatū Gorge), where the river bisects the Tararua and Ruahine Ranges. Emerging from the gorge on the eastern side of the ranges, Whatonga beheld a vast forest which he named Te Tāpere Nui o Whatonga.[10]

It was here that he encountered the local rangatira, Tamakuku, who gave his granddaughter Reretua to Whatonga to be his second wife.[11] Reretua gave birth to a son, named Tautoki. On attaining manhood, Tautoki married Waipuna, a descendant of Kupe who lived at Akitio on the Wairarapa coast. Their son was Rangitāne. Hoani Meihana told the Ngāpaeruru title investigation: "Rangitāne the ancestor had rights within the boundary [of the block] from Tukituki that I have given to Akitio. All the forest land about Tamaki was his."[12]

Whatonga was reunited with his first wife, Hotuwaipara, and their son Taranohu (Tara), but the reconciliation did not last. After a quarrel, Hotuwaipara and Tara remained at Heretaunga, while Whatonga went with his second wife Reretua and his grandson Rangitāne into the forest country, settling at Rakautatahi, which became their principal settlement. Hoani Meihana states: "Te Koru, Horehore, Tataiwhetu, Te Katea were their pas. These pas are on Takapau and Rakautatahi [blocks]."[13] Rangitāne later led his people further south into the great bush, to Tamaki nui a Rua. He built pa at Raekāpua, Tanatawhaki, Pukehou and Otupopoto, all of which were located in the Tamaki district. Parsons states:

> Rangitane married twice. His first wife was Mahue and he had one son by her named Kopuparapara. Mahiti was his second wife. They had one son named Te Whetuki. Apart from the above details, Rangitane['s] life is not well documented. According to Rangitane tradition, he was taken back to Heretaunga when he died and is buried on Kahuranake mountain.[14]

Rangitāne's rights to Te Tāpere Nui a Whatonga derived from his grandmother Reretua, whose grandfather Tamakuku was the leading rangatira in the district when Whatonga arrived. Thus, while Rangitāne himself probably lived during the mid-1300s, his intermarriage with the original tangata whenua means Rangitāne rights in the Tamaki Nui a Rua district are of even more ancient origin. Figure 1 (overleaf) illustrates these relationships, showing Rangitāne's descent from Toi and Whātonga and his connection though Whātonga to his Ngāti Tara neighbours to the north.

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[10] McEwen, J. M., *Rangitāne: A Tribal History*, Auckland, Reed Books, 1986, p. 21.

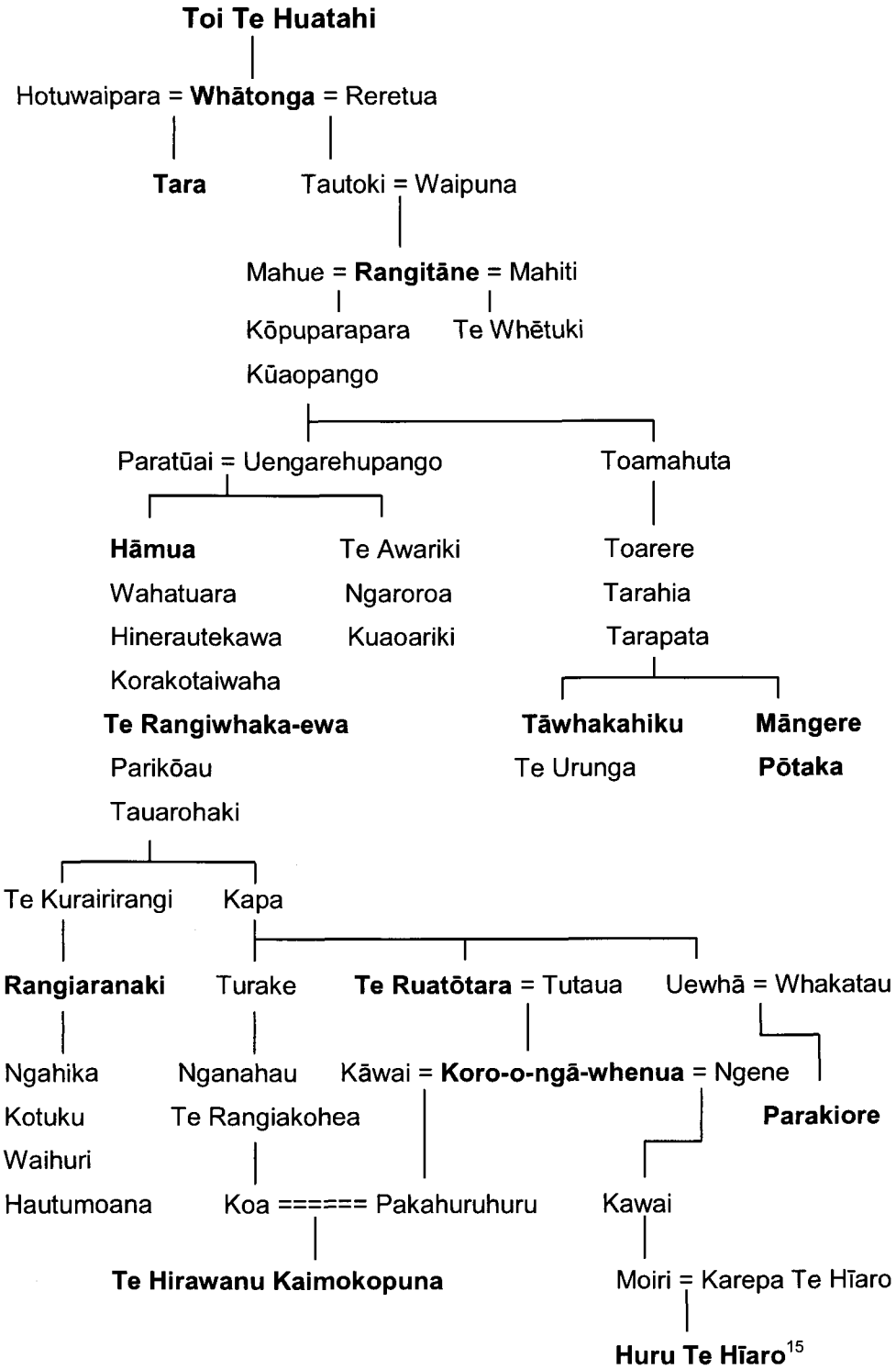
[11] According to Pat Parsons and Dorothy Ropiha, Tamakuku was the son of Kupe's sibling, Nukutoea. "Rangitane O Tamaki Nui A Rua, Traditional History Report", 2003, p. 8.

[12] Evidence of Hoani Meihana Te Rangiotu, Ngapaeruru hearing, Napier MB 24, p. 217.

[13] Evidence of Hoani Meihana Te Rangiotu, Ngapaeruru hearing, Napier MB 24, p. 223.

[14] Parsons, "Waitahora Wind Farm: CVA", p. 4.

**Figure 1: Whakapapa from Whātonga to Rangitāne and Te Hirawanu Kaimokopuna**




[15] The above whakapapa is adapted from Parsons, "Waitahora Wind Farm: CVA", p. 5; supplemented by various whakapapa appended to McEwen's *Rangitāne* (pp. 233-278).

The descendants of Rangitāne achieved dominance in Tamaki nui a Rua by the time of Hāmua (some 17 generations ago). They have maintained their ahi kaa (occupancy) and mana whenua (customary rights) in the district since that time, despite being challenged by groups descended from Whatuiāpiti, Ngāi Tahu and hapū of Ngāti Kahungunu. Conflicts were resolved through intermarriage to the extent that, by the end of the eighteenth century, all Māori in Tamaki nui a Rua could whakapapa to multiple hapū and iwi. Those tūpuna who became eponymous ancestors of major Rangitāne hapū in their own right, or whose activities are recorded in this narrative, are represented in bold font in Figure 1.

## 1.4 The migration of Ngāti Kahungunu

The descendants of Rangitāne had occupied the Tamaki nui a Rua district for some 200 years when a powerful new group of hapū, who shared a common descent from the great chief Kahungunu, began to make their presence felt in the region. Initially, conflict was confined to the Heretaunga district, with Ngāti Tara (relatives of Rangitāne) bearing the brunt of the fighting. In some versions of these events, Ngāti Tara chiefs are identified as Rangitāne, which tends to suggest that the battles were fought between Ngāti Kahungunu and Rangitāne, over-simplifying what was a complex series of retaliatory raids fought amongst a number of inter-related hapū and iwi.

Indeed, the traditions also record fights between Rangitāne and Ngāti Tara at this time; for example, the killing of Te Rironga of Ngāti Tangimoana by his brother-in-law Tuaiti triggered a series of vengeful killings. Te Rironga's wife, Tūtahuna belonged to Ngāti Tara, which led Rangitāne to ally themselves with Ngāti Tangimoana at the battle of Kahuterei where Tuaiti was killed and his people defeated. The son of Te Rironga and Tūtahuna, Ruatāmore went to live with Rangitāne at Takapau, where he married a local woman named Uaroi. However, Ruatāmore failed to repay his hosts' help and hospitality, killing his wife's grandfather, the Rangitāne chief Te Awariki.[16] A Rangitāne war party led by Ngaroroa (Te Awariki's son and Uaroi's father), defeated Ruatāmore and all but wiped out his people. Parsons states:

> The two war parties engaged on the banks of a stream a few kilometres east of Ormondville. Rangitane killed Ruatamore and many of his followers. The bodies piled up in the stream which became known as Te Waikopiro o Ruatamore, the place where the bodies of Ruatamore piled up.[17]

[16] McEwen, J. M., *Rangitāne*, pp. 34-37.

[17] Parsons, "Waitahora Wind Farm: CVA", p. 6.

Ruatāmore's son, Poutoa, survived with his mother's Rangitāne people, eventually moving to Te Ahuatūranga block, near the eastern end of the Manawatū Gorge. Parsons observes that Ngaroroa and his cousin Wahatuara were leaders of Rangitāne when the Kahungunu people migrated to Heretaunga and came into conflict with the local people. However, neither was named as a participant in the conflicts at Heretaunga, which Parsons interprets as evidence that Rangitāne were not living in the contested area and had already established themselves as permanent residents of the Tamaki nui a Rua district at this time.

Rather, while the descendants of Ngāti Kahungunu fought for control of Heretaunga, Rangitāne were consolidating their occupation of Tamaki nui a Rua through the efforts of Tāwhakahiku and Māngere, the sons of Tarapata, who fought and defeated the Ngāti Hotu, Ngāti Moe (Mamoe) and Ngāi Tara at Te Umutaoroa (just north of present-day Dannevirke).

Tamakere, Rakaumaui and Poutoa, the son of Ruatamore, assisted in this conquest, which extended southwards as far as Pahiatua, Eketāhuna, Te Hawera (Hāmua) and Tūtaekara.[18] McEwen adds:

> Tāwhakahiku and Māngere then crossed the Tararua range near the present Pahiatua track and entered the Manawatu district. Coming down to the Manawatu plain from this direction, they took the local people by surprise and were thus enabled to gain a foothold fairly quickly.[19]

The two brothers led the Rangitāne conquest of the Manawatū, until they finally met their deaths at Te Reporua, near Lake Papa-i-tonga in the Horowhenua district.[20] Their exploits ensured that Rangitāne mana whenua was established on both sides of the dividing range by the late sixteenth century.

Tāwhakahiku and Māngere descend from Uengarehupango's brother, Toamahuta, and were contemporaries of Te Rangiwhaka-ewa's father, Korakotaiwaha. Their conquests in Tamaki nui a Rua were consolidated in the next generation by Te Rangiwhaka-ewa, whose dealings with Te Whatuiāpiti and Angiangi on Rangitāne's northern borderlands are well documented.[21]

By the eighteenth and early nineteenth centuries, the descendants of Rangitāne dominated the upper Manawatū River region and the district east of the northern Tararua Ranges, extending across the Puketoi hills to Akitio, Mataikona and Rangiwhakaoma (Castle Point) on the Wairarapa coast. Rangitāne hapū included Ngāti Hāmua, whose territory extends from the Manawatū River to Te Oreore

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[18] McEwen, J. M., *Rangitāne*, pp. 51-52.

[19] Ibid., p. 52.

[20] Ibid., pp. 53-54.

[21] Ibid., pp. 66-70.

(Masterton), Ngāti Te Rangiwhaka-ewa, Ngāti Rangiaranaki, Ngāti Mutuahi, Ngāti Pakapaka and Ngāti Parakiore, whose intersecting rohe include all the land once covered by the great forest.

Over many generations, frequent intermarriage occurred between the descendants of Rangitāne and Kahungunu. Hōri Rōpiha, a Rangitāne leader prominent in the second half of the nineteenth century, is reported as stating:

> E rua nga iwi o Heretaunga nei, ko Rangitane tetahi, ko Kahungunu tetahi. Kua hawhe-kaihe o matou tupuna tae noa ki a matou nei. Ka karangatia matou, e rua nga iwi ko Rangitane, ko Kahungunu.[22]

This has been translated as:

> There are two tribes in Heretaunga, one is Rangitane and one is Kahungunu. Our ancestors were half-castes, right up until our time. We are described as two tribes, Rangitane and Kahungunu.[23]

Rangitāne strongly assert that while their ancestors intermarried extensively with Kahungunu, both groups retained their separate identities and Rangitāne have maintained their ancestral rights within Tamaki nui a Rua. During the eighteenth century and into the early-nineteenth century, inter-hapū warfare throughout Hawke's Bay and the Wairarapa was endemic, despite shared ancestry. However, after 1820, "localised conflicts were elevated to a new plane upon the introduction of musket-armed war parties from afar."[24]

In the early 1820s, large taua from Tai Tokerau (Ngāpuhi) and other regions raided the Hawke's Bay and Wairarapa districts. In 1833, a heavily armed war party from Taranaki swept through the district, prompting a general evacuation, with many hapū gathering together for protection at strongholds such as Nukutaurua, near Māhia Peninsula in Northern Hawke's Bay. For their part, some Rangitāne sought refuge in the Puketoi and Tararua ranges. The gathering together of many different hapū at Nukutaurua had a unifying effect; with Kahungunu identified as the one tupuna from whom all could trace their descent. Thus, when the people began to return to their home territories, it was with a new sense of identity as Ngāti Kahungunu, to the extent that the whole of the North Island's lower east coast, from Māhia to Palliser Bay, came to be seen as the rohe of Ngāti Kahungunu.

As already noted, some Rangitāne remained at Tamaki nui a Rua, rallying under the leadership of Ngāti Parakiore and occupying a series of fortified pā that ringed the

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[22] Ropiha in Jock McEwen nd. Migrations to, and settlements of, the Wellington area. MS held at Victoria University Library.

[23] Translation by Steven Chrisp, pers. comm.

[24] Robertson, S., "The Alienation of the Seventy Mile Bush (Wairarapa)", CFRT, 2001, p. 9.

perimeter of the Great Bush.[25] When William Colenso journeyed through the forest in 1846, he found a small group of Rangitāne living at Te Hawera, under the leadership of Te Hiaro.[26] Rangitāne were also living further east at Ihuraua; at this time, Te Hirawanu Kaimokopuna was acknowledged as the leading chief of Rangitāne o Tamaki nui a Rua.[27] Thus, once the musket wars ended, Rangitāne re-occupied their ancestral lands and were living there when the first Pākehā visited the district.

When Te Hirawanu died, he was succeeded by his nephew Huru Te Hiaro and the latter's cousin, Nireaha Tamaki. These two represented Rangitāne o Tamaki nui a Rua in their dealings with the Crown during the second half of the nineteenth century and, in the case of Nireaha, into the second decade of the twentieth century.

## 1.5 Rohe and traditions of Rangitāne Hapū affected by the Woodville and Pahiatua STPs

### 2.5.1 Territorial interests of Te Kāuru Hapū Collective

| Hapū | Rohe |
|---|---|
| Ngāti Mārau<br>Ngāti Rangitotohu<br>Ngāi Tahu<br>Ngati Ruatōtara<br>Ngāti Te Opekai | Headwaters of the Manawatū River, north of Dannevirke; includes the Umutaoroa, Piripiri, Te Ohu and Ngāmoko blocks |
| Ngāti Parakiore | East of Dannevirke, where the Manawatū River bends southward; includes the Rakaiatai, Otanga, Tiratū, Ngāpaeruru, Mangapuaka, Wharawhara, Waikopiro and Tuatua blocks. |

[25] Manahi Paewai, pers. comm. Ngāti Parakiore are a hapū of Rangitāne; and see: Ballara, *Iwi*, p. 139.

[26] Bagnall & Petersen, *Colenso*, p. 230. The settlement of Te Hawera was also known as Hāmua, located on a small hill about 15 kilometres south of Pahiatua, opposite the intersection of State Highway 2 and the Hāmua-Rongomai Road.

[27] The plan of the Mākuri block (Puketoi Nos 4 & 5), drawn up by G.S. Cooper in 1853 and recorded in Turton's Deeds, Vol. II, states that all of the land to the west of the Mākuri block belonged to Te Hirawanu of Rangitāne.

| Hapū | Rohe |
|---|---|
| Ngāti Pakapaka | South east of Dannevirke, east of the Manawatū River; includes the Kaitoki, Ōtāwhao, part of Puketoi 1, Puketoi 3, and Mangatoro blocks, and shares the southern parts of Ngāpaeruru and Tiratū with Ngāti Parakiore. |
| Ngāti Mutuahi | Large area bounded by the Ruahine Range to the west, the Umutaoroa block to the north, slightly beyond the Manawatū River to the east, and the Manawatū River at the Gorge to the south; includes the Tamaki, Tipapakuku, Tahoraiti, Oringiwaiaruhe, parts of Puketoi Nos 1 & 3, Te Ahuatūranga and Māharahara blocks. |
| Ngāti Te Koro<br>Ngāi Te Kapuārangi<br>Ngāti Hāmua | The whole catchment south of the Manawatū Gorge, east of the Tararua Range, beyond Eketāhuna to the south and on both sides of the Puketoi Rangel; includes the Kaihinu, Mangahao, all of the Manawatū-Wairarapa blocks, the remaining Puketoi blocks, Ihuraua and the Ngātapu blocks. |

**(refer to Appendix 2, B1.2 for Te Kāuru Hapū Map)**

### 1.5.2 Ngāti Mutuahi

As noted above, Ngāti Mutuahi is the hapū whose customary interests include the site of the Woodville Sewage Treatment Plant. Ngāti Mutuahi and their neighbouring hapū Ngāti Pakapaka are descended from the major Rangitāne hapū, Ngāti Te Rangiwhaka-ewa. The names Ngāti Mutuahi and Ngāti Pakapaka commemorate significant events, rather than the usual practice of naming hapū after particular ancestors.

Ngāti Pakapaka take their name from the repercussions of a fight that occurred about 1800 when Ngāti Te Rangiwhaka-ewa were attacked by a raiding party.[28] Two brothers were killed during the course of a raid; however, Rangitāne re-gathered their forces and turned the tables on the invaders, capturing their chief, Marangaihenuku. Whērakaiterangi, the sister of the two men who had died, insisted

[28] McEwen, *Rangitāne*, pp. 108-109. It is apparent from McEwen's account that fighting between these people had been on-going for a number of generations.

on killing her enemy herself, which set up an utu debt against her and her people. Whērakaiterangi's husband, Ngārara, was a grandson of Parakiore's half-brother, Takitahi. Some years later, Ngārara was captured by Ngāti Raukawa, a Tainui people at that time seeking to gain a foothold in Hawke's Bay. The Raukawa taua (war party) took Ngārara "to Paranui pa at Motuiti near Foxton", where he was killed and consigned to the oven. His descendants commemorated his death by taking the hapū name of Ngāti Pakapaka (Pakapaka = baked).[29]

Ngāti Mutuahi derive their name from an incident arising from a dispute between Rangitāne and their Ngāti Kahungunu kin to the north. It also involved Ngāti Raukawa, who were seeking revenge for one of their chiefs, Te Momo o Irawaru, killed in an earlier exchange at Te Roto a Tara, near Te Aute.[30] On this occasion, Te Hirawanu of Ngāti Te Rangiwhaka-ewa allied himself with the Ngāti Raukawa chief Te Wahanui in an attack on the Ngāti Kahungunu pā at Tangoio, north of Bay View.[31] The invaders killed several prominent people, including the mother of the chief Te Moananui. The taua then moved south to Waimārama where, after an initially futile pursuit, they eventually managed to capture or kill members of a single family. One of the victims was consumed by both Ngāti Raukawa and Ngāti Te Rangiwhaka-ewa; the others were taken to Ōtaki by Ngāti Raukawa.

These actions could not go unpunished and soon the Ngāti Kahungunu chiefs Pareihe and Te Hāpuku, accompanied by the Ngāpuhi chief Te Wera and his musket-armed kinsmen, launched an attack on Rangitāne seeking utu. McEwen states:

> They attacked the [Ngāti Te Rangiwhaka-ewa] at Ngātoto pa, situated on the Manawatu at Te Ruru, where the Kumeroa cemetery is now [i.e. – immediately to the east of Woodville]. In this engagement Te Hirawanu's son Haereroa was killed and his body was later eaten by Te Hāpuku and others. Te Hirawanu's cousin was captured. She was taken as a wife of Te Hāpuku...
>
> The cooking of Te Hirawanu's son led to the adoption of the name Ngāti Mutuahi (mutuahi = cut off by fire) by the Rangitāne sub-tribe formerly known as Ngāti Te Rangiwhaka-ewa.[32]

Kumeroa cemetery reserve is located near the junction of Cemetery Road and Potter Road, on the banks of the Manawatū River a short distance northeast of Kumeroa.[33]

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[29] Ibid., p. 109.

[30] McEwen, *Rangitāne*, p.133.

[31] Tangoio is located on the Hawke's Bay coast, north of the Napier-Taupō Road turnoff, where State Highway 2 turns inland.

[32] McEwen, *Rangitāne*, p. 134. McEwen cites various manuscripts held at the Alexander Turnbull Library as his sources, including those of Ranginui Rautahi, Mohi and Hori Ropiha, as well as S. P. Smith Notebook No. III (Polynesian Society MSS).

[33] The cemetery reserve was gazetted in 1888. *NZ Gazette* 1888, p. 304. J.M. McEwan reports that Kumeroa cemetery is located on the site of Ngatoto Pā; however, Manahi Paewai states he and his brother Stephen "met

Patrick Parsons and Dorothy Ropiha report that Hoani Meihana spoke of the killing of Haereroa by the Ngāti Kahungunu raiding party in his evidence to the Ngapaeruru Native Land Court hearings, quoting him as follows:

> Ngati Kahungunu retaliated and defeated Rangitane at Te Ruru and my elder sister, Wiramina, was taken prisoner. It was a Rangitane settlement and Hirawanu Kaimokopuna's little boy was killed. Whakarongo, sister of Hirawanu (his cousin in fact) was also taken prisoner and taken to wife by Hapuku. Hirawanu's wife and younger brother were also killed.' Haereroa, the son of Hirawanu was cooked and eaten and this was the origin of the hapu Ngati Mutuahi.[34]

Te Hirawanu composed a tangi (lament) to commemorate the death of his son; it is transcribed here, along with a translation.[35]

**"The tangi of Te Hirawanu Kaimokopuna for his son, Haereroa, and his cousin"**

| | |
|---|---|
| E hika ma, e, kei te haurangi au | Friends, I know not what to do |
| He kainga nahaku i te ao e rere | My food is the cloud which floats above, |
| Koe ao pāraki e riringi mai nei | A cloud from the north sprinkling rain, |
| I haere mai ra koe i runga o Ahuriri | You came from above Ahuriri, |
| I aku tumanako e whakarei noa nei, e. | From my hopes now dashed. |
| Taku nui, taku tiketike, i te rau o te raro, e. | My great one, my exalted one in the north, |
| Haere ra, e hika, koutou ko o mātua. | Farewell, son, to you and your elders. |
| Naku koutou koi kai horatia, e, | You were mine, not to be consumed at random, |
| Koi nuku mahoratia ki runga i Takapau-whāranui | Or scattered about at Takapau-whāranui, |
| I whiua, i tāia mo Wairokiroki. | Driven and beaten because of Wairokiroki. |

McEwen states that later in the nineteenth century, after much of their land was sold, hapū of Rangitāne left their kāinga and pā along the river banks and resettled near roads, the new means of getting about the country. Thus, Ngāti Mutuahi went to live at Tahoraiti and Tawakeroa, while their Ngāti Pakapaka kin went to live at nearby Kaitoki. In 1883, a large wharenui named Aotea Tua-Rua was built at Tahoraiti, the imprint of which can still be seen. During the twentieth century it fell into disrepair and was eventually rebuilt at Mākirikiri, where it stands today. Opened in 1967 by the

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with Peter Jones of Woodville on Friday 24th May 2013 and visited the Ngatoto Pa site, which is near the Kumeroa village. The site is on the Druce property and overlooks the Kumeroa Valley through which the Manawatū River flows." Written feedback, by email, 26 November 2014.

[34] Parsons Patrick & Dorothy Ropiha, "Rangitane o Tamaki nui a Rua Traditional History Report" (2003) p. 49.

[35] Song No. 20 "The tangi of Te Hirawanu Kaimokopuna for his son, Haereroa, and his cousin", dictated by Ranginui Rautahi, in McEwen, *Rangitāne*, p. 207.

Prime Minister, the Rt Hon. K. J. Holyoake, the third incarnation of the wharenui was named Aotea Tua-Toru.[36]

Aotea Tua Toru, Makirikiri Marae, Dannevirke

### 1.5.3 Ngāti Te Koro

**(refer to Appendix 2, B1.3 Block Map)**

Ngāti Te Koro is one of the hapū whose customary interests include the land south of the Manawatū Gorge. Their rohe is strategically located between the two sewage treatment plants and includes the river systems into which the plants discharge treated wastewater. Ngāti Te Koro trace their descent from the tupuna Te Koro-o-ngā-whenua, the son of Te Ruatōtara. It will be noted that the latter is the eponymous ancestor of the Ngāti Ruatōtara hapū of Rangitāne, who are also members of Te Kāuru Hapū Collective. Both Te Koro-o-ngā-whenua and Ruatōtara are descendants of Te Rangiwhaka-ewa.

[36] *Te Ao Hou: The New World*, No. 60 (September 1967), pp. 29-31. National Library of New Zealand.

The whakapapa chart depicted in Figure 1, above, indicates that Te Koro had two wives, the sisters Kāwai and Ngene. There were many descendants from these marriages, notably Te Hirawanu Kaimokopuna, who descends from Te Koro and Kāwai; and Huru Te Hiaro, Nireaha Tamaki and Hohepa Paewai, who come from the marriage of Te Koro and Ngene.[37]

A famous kōrero relating to Te Koro concerns his attendance at a feast given by Ngāti Apa in the Rangitīkei district west of the dividing ranges. During the festivities, Te Ngawhā (one of the hosts) made a play of his name (Te Koro = Old Man), comparing him to 'te koro mangō i te moana', 'the old man shark in the sea'. Te Koro said nothing until they were about to leave, when during his poroaki (speech of farewell) he indicated to Te Ngawhā that the insult had been heard and would be repaid in due course.[38] Te Ngawhā accepted the challenge.

A short time later a chief named Puhitahi of Rangitāne O Manawatū led a combined force with Te Koro to attack the Ngāti Apa pā at Te Awemate, an island in a lagoon between Parewanui (near Bulls) and the coast. Battle was eventually joined on flat ground south of the lagoon where, in a fight later called 'Pākiri', Rangitāne gained the victory, killing a number of Ngāti Apa chiefs including Te Ngawhā.[39] McEwen reports that the descendants of Te Koro lived on the Mangahao block, which is the area of land between the Mangahao River and the tops of the Tararua Range. The northern boundary of the Mangahao block is the Manawatū River where it enters the gorge; Te Ahuatūranga block lies opposite on the northern side of the river.

Te Ahua Tūranga-i-Mua Marae at Woodville is a community marae (Te Hau e Wha), which is open to all, while naturally recognising local hapū: Ngāti Rangiwhaka-ewa, Ngāti Te Koro and Ngāti Parakiore. Mrs Hanatia Palmer of Pahiatua, in an interview conducted for the current project, quoted her late mother as saying that the site of Te Ahua Tūranga Marae at Woodville was a meeting place where Ngāti Hāmua (a southern hapū of Rangitāne O Tamaki nui a Rua) would meet with the people from north of the gorge.[40] The meeting place, which was marked by a small raised area or mound, held great significance because of its association with the aforementioned Tūranga.

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[37] McEwen, *Rangitāne*, p. 263, Chart XXIX, 'Descendants of Korokotaiwaha'.

[38] McEwen, *Rangitāne*, pp. 118-119.

[39] Ibid., pp. 119-120.

[40] Interview with Hanatia Palmer, Rangitāne o Tamaki nui a Rua Offices, Dannevirke, 21 August 2014.

### 1.5.4 Ngāi Te Kapuārangi

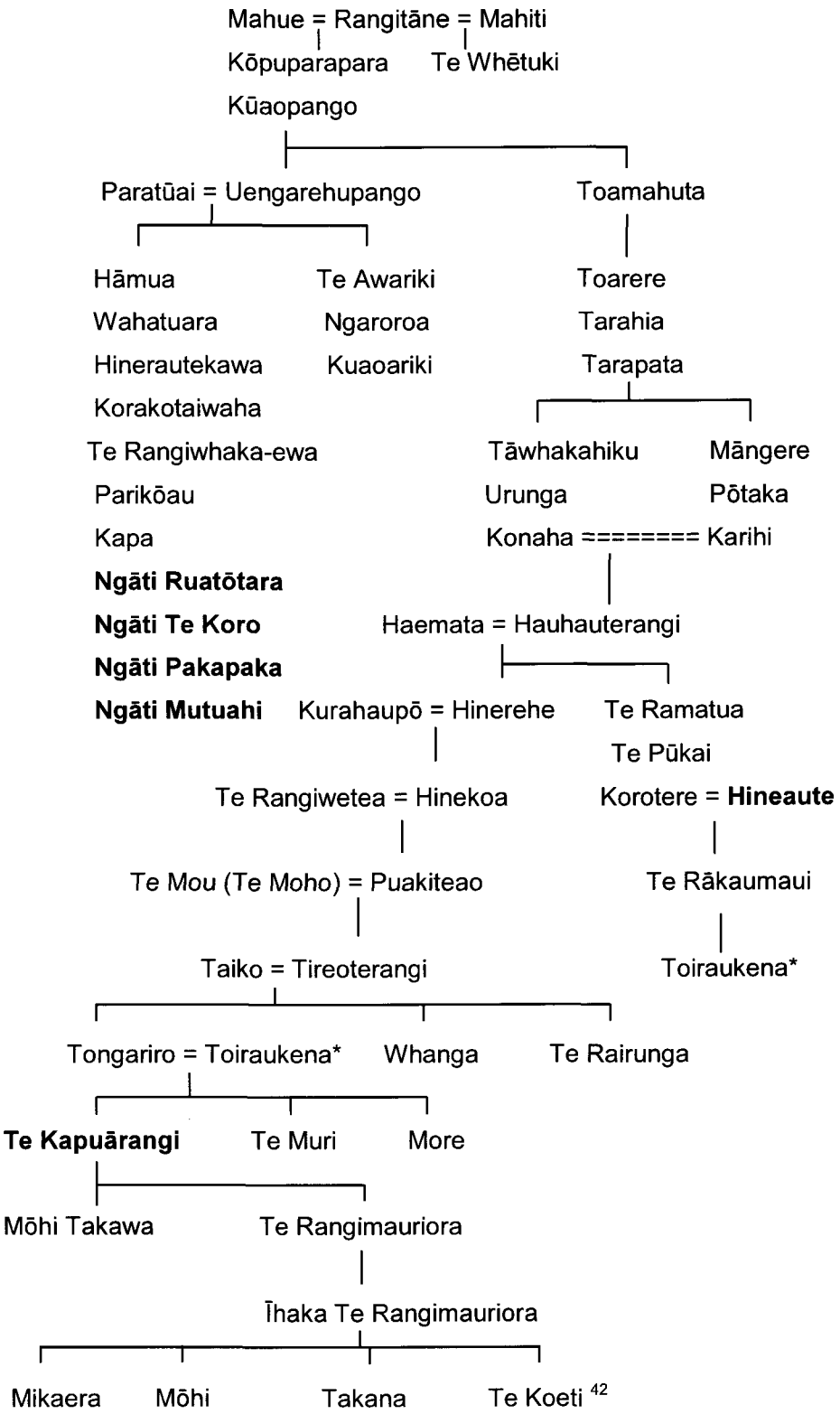
**(refer to Appendix 2, B1.3 Block Map)**

The customary rights of Ngāi Te Kapuārangi include Pahiatua and the (Mangatainoka) river system affected by wastewater discharge from the Pahiatua STP. The hapū is named after Te Kapuārangi, a tupuna with strong connections to Rangitāne ancestors from both sides of the Tararua Ranges. Hence, today Ngāi Te Kapuārangi is a constituent hapū of both Rangitāne O Tamaki nui a Rua and Rangitāne o Manawatū. While the descendants of Te Rangiwhaka-ewa (including Ngāti Mutuahi and Ngāti Te Koro) trace a direct line from Hāmua and his father, Uengarehupango. Te Kapuārangi in addition to a descent line from Hamua, descends from Uengarehupango's brother, Toamahuta, who was the ancestor of the famous brothers, Tāwhakahiku and Māngere (see Figure 1, above).

When the Pahiatua block first passed the Native Land Court in 1871, very little detailed evidence about settlement patterns and resource use was presented. In 1896, when the Native Appellate Court held a hearing to determine who should receive compensation for the original under-estimation of the area of the Manawatū-Wairarapa 2B/Pahiatua block, a more detailed picture emerged from the evidence.[41] During the vigorously contested hearing the opposing parties debated subtle nuances of whakapapa (genealogy) to demonstrate their descent from Māngere's son Pōtaka, who all acknowledged was the first to establish Rangitāne mana whenua at Pahiatua. Hoani Meihana represented western Rangitāne along with his main witness Waata Tohu, who put forward the descent lines illustrated in Figure 2 (overleaf).

[41] The area of the Manawatū-Wairarapa 2B/Pahiatua block was originally estimated at 15,000 acres; however, on survey it was found to comprise 22,625 acres, so the Crown agreed to pay the original owners/vendors or their descendants the sum of £1,900 compensation to top up the initial purchase. The 1896 hearing was held to determine how that money should be apportioned.

**Figure 2: Descent lines of Ngāi Te Kapuārangi**




[42] This whakapapa chart is based on the evidence of Waata Tohu, Pahiatua Compensation Appeal, 14 October 1896, Ōtaki MB 28B: p. 65.

In his evidence, Waata Tohu spoke of a number of kāinga (settlements) on the Pahiatua block, which included Aotea, Turakirae and Waiaua. According to Waata, Aotea was a kāinga of an ancestor named Tireokiterangi and his mokopuna (grandson) Te Kapuārangi.[43] The Waiaua kāinga contained two whare named Te Koperetao and Tūpaki, originally belonging to Pōtaka and Te Urunga, which since their time had been occupied continuously over several generations "down to the time of the Pakeha."[44] Waata Tohu also spoke of a great hākari (feast) hosted at Aotea by Te Aokautere, Takawa and Te Hirawanu, a collaboration that highlighted their close whanaungatanga (kinship).[45] He went on to speak of the time Donald McLean purchased the Ihuraua block, on the southwest side of Manawatū-Wairarapa No. 2. Te Hirawanu had told McLean he would not permit the sale to cross the Tiraumea Stream, setting up a post called Te Kapuārangi to mark the boundary of his territory.[46]

Nireaha Tamaki represented those connected to the eastern side of the range where the land was actually located. In setting up his competing claim, Nireaha Tamaki also nominated Pōtaka as his ancestral right, tracing the descent down to his mother Maraea through a different line, thereby excluding Tireokiterangi, whose rights he denied. He said the houses and kāinga spoken of by Waata belonged to his ancestors. Nireaha also denied the kōrero about the post set up by Te Hirawanu, saying instead that it was called 'Tikapuarangi' and was put there by Kerei to stop people killing pigs.[47] The whakapapa from Pōtaka to Maraea and Nireaha is presented in Figure 3, overleaf.[48]

According to J. M. McEwen, Tireokiterangi's mother Puakiteao was from Tamaki and 'Tireo' was born there on the eastern side of the range. However, during his lifetime, Tireo spent most of his time on the western side at Manawatū and Horowhenua.[49] Clearly, there were regular comings and goings, including intermarriage between the Manawatū and Tamaki side of the ranges during this period. Tireokiterangi's second wife, Taiko returned with their five children to live in the Tamaki/Pahiatua district. Tongariro, their eldest son married a woman called Toiraukena, who was affiliated to Pōtaka through another line. They in turn produced Te Kapuārangi, who could therefore trace descent from Pōtaka through both sides of his whakapapa.

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[43] Evidence of Waata Tohu, Pahiatua Compensation Appeal, 14 October 1896, Ōtaki MB 28B: p. 65.

[44] Ibid.

[45] Takawa was Te Kapuarangi's eldest son, while Te Aokautere and Te Hirawanu were the son and grandson respectively of Te Kapuarangi's brother who was a sibling of, Te Muri.

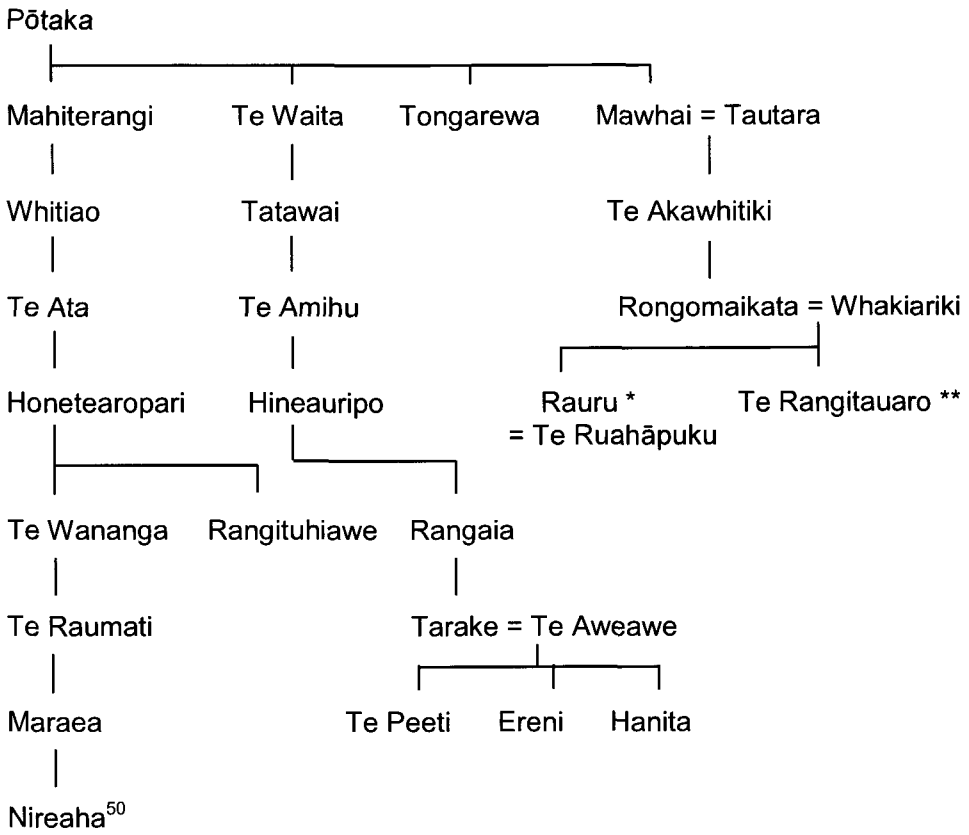
[46] Evidence of Waata Tohu, Pahiatua Compensation Appeal, 14 October 1896, Ōtaki MB 28B: p. 66.

[47] Evidence of Nireaha Tamaki, Pahiatua Compensation Appeal, 15 October 1896, Ōtaki MB 28B: p. 80.

[48] Ibid. p. 78.

[49] McEwen, *Rangitāne*, pp. 97-100.

**Figure 3: Descent of Nireaha Tamaki from Pōtaka**




Īhaka Te Rangimauriora was Te Kapuarangi's grandson and the acknowledged chief of the Pahiatua district in his time, as was his son, Mikaera Te Rangipūtara. At the time of the Seventy Mile Bush purchase, Mikaera lived at Tūtaekara, which was then a clearing in the Great Bush. A government official, James Grindell, who visited Te Rangipūtara at his bush clearing in 1873 reported: "The bush contained innumerable wild pigs, cattle, even horses while the pigeons perched on the trees like bees." Describing Te Rangipūtara as "the only remaining chief of note of the Rangitāne tribe", Grindell stated that he "reputedly only came out of the forest on very important occasions".[51]

According to whakapapa recorded in the Land Court minutes, Mikaera Te Rangipūtara was married to Rea, first cousin to Nireaha's mother Maraea (see Figures 4 & 5, below).[52] Rangitāne O Tamaki nui a Rua records indicate that Mikaera was also married to Rāhira, the mother of Mrs Palmer's grandfather, Te Ao Tātaurangi Mikaera (Figure 5). Thus, the descendants of Te Rangipūtara were able

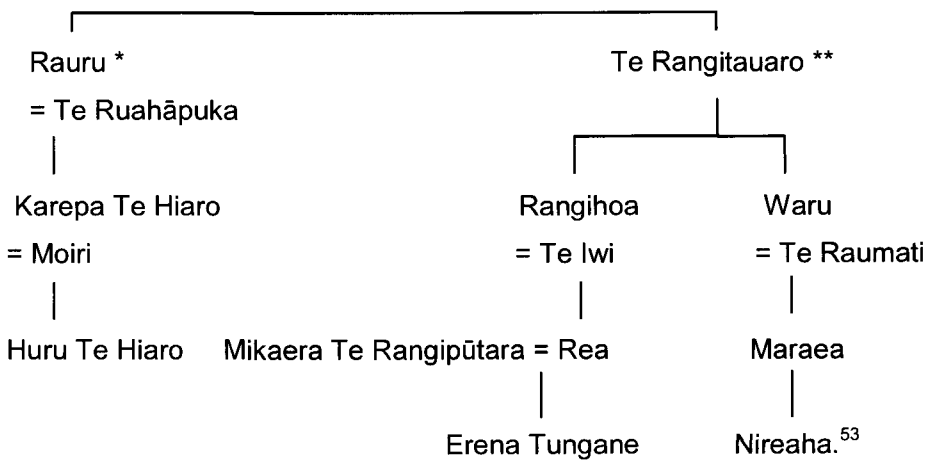
[50] Evidence of Nireaha Tamaki, Pahiatua Compensation Appeal, 15 October 1896, Ōtaki MB 28B: pp. 79-80.

[51] Bagnall, A.G., *Wairarapa: An Historical Excursion*, Masterton, Headley's Bookshop, 1976, pp. 259-260.

[52] Rea Pūtara also appears as Rea Mikaera in the ownership lists of various Mangatainoka blocks.

to trace their descent from Pōtaka through the lines set up by both the western and eastern branches of Rangitāne.

**Figure 4: Descent of Nireaha Tamaki from Pōtaka**




Mrs Hanatia Palmer is the granddaughter of Te Ao Tātaurangi Mikaera, the son of Mikaera Te Rangipūtara. Mrs Palmer states that her ancestor Īhaka Te Rangimauriora lived at Tūtaekara, about 9.5 kilometres south of Pahiatua on the Mangatainoka River, where the tupuna whare was known as Raupānui. She adds that the name of the kāinga, 'Tūtaekara' referred to a chief who suffered from an unfortunate case of dysentery. 'Raupānui' refers to the heavily calloused skin of feet unused to wearing shoes.[54] Hanatia was raised with her grandparents in a house on the opposite of the road from where this whare tupuna once stood. A direct descendant of Te Kapuārangi, the descent lines of Mrs Hanatia Palmer are shown in Figure 5, overleaf.

Mrs Palmer recalls the settlement and meeting house at Ngaawapurua, situated on the river's edge where the rail bridge meets the southern bank of the confluence of the Tiraumea and Manawatū Rivers. There were mara (gardens) along the river banks and she remembers as an eight-year old fishing there for tuna (eels).[55] The first meal from this harvest would be eel bones and pūhā, while the flesh was preserved by salting and drying on the washing line. The rivers also provided kākahi (fresh water mussels). The meeting house at Ngaawapurua was subsequently washed away by a flood.[56]

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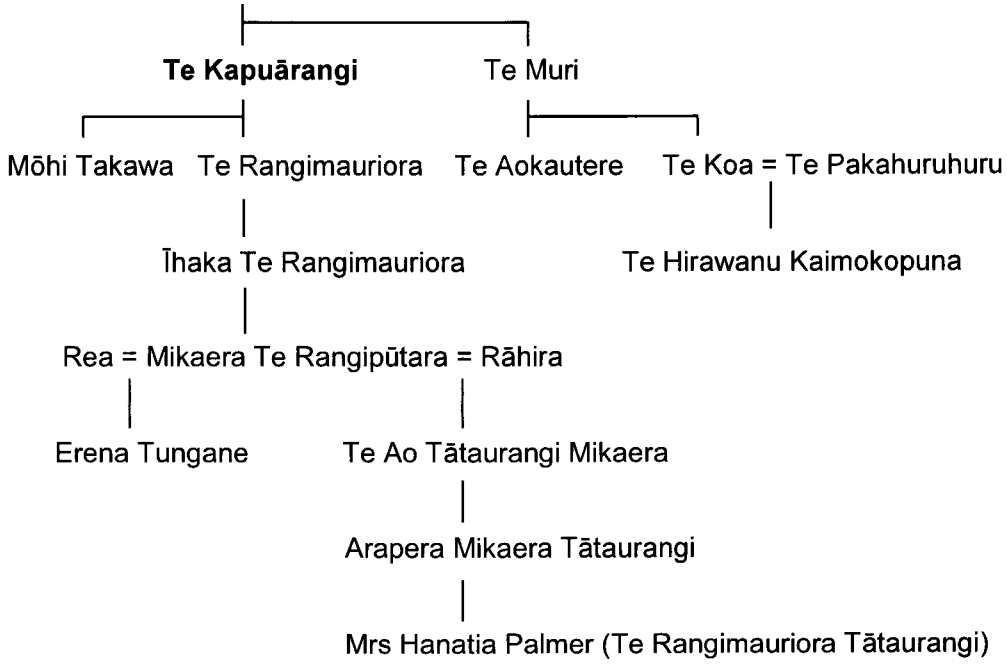
[53] Nireaha's whakapapa covers pages 79 & 80 in the minute book.

[54] Interview with Hanatia Palmer, Rangitāne o Tamaki nui a Rua Offices, Dannevirke, 21 August 2014.

[55] Ibid. When she was 8, Hanatia had the job of stunning the tuna by hitting their tails with a rock, then cutting their throats and stringing them up on a flax line.

[56] Ibid.

**Figure 5: Descent of Mrs Hanatia Palmer of Pahiatua**




In more recent times, it is noted there is a popular swimming hole close to the wastewater discharge point of the Pahiatua Sewage Treatment Plant. While the net effect of the discharge is negligible in scientific terms given that on current measurements the wastewater discharge is effectively less contaminated than the river water it is feeding into, in tikanga Māori terms it is not acceptable for the wastewater from the STP to be mixed with water used for other human activities. Downstream from the discharge point on the banks of the Mangatainoka River is the Cross Road cemetery at Mangatainoka Village. Once again, Māori cultural practises proscribe such an association.

# 2 Rangitāne o Tamaki nui a Rua and the Crown

## 2.1 Land alienations in the nineteenth century [57]

A comprehensive review of early Crown purchases, land title investigations and subsequent sales in Tamaki nui a Rua during the nineteenth century is well beyond the scope of this report. Nevertheless, certain aspects of the sales are relevant to Rangitāne mana whenua as it relates to the sites of the Woodville and Pahiatua Sewage Treatment Plants.

In the previous section we established that Rangitāne O Tamaki nui a Rua held mana whenua in the Tamaki nui a Rua district at 1840 and had done so for at least 500 years. In many respects, they shared the same traditional narratives as their Rangitāne kin living on the western side of the Tararua range. Over many generations following the time of Tawhakahiku and Māngere, the Rangitāne hapū on each side of the dividing range developed different characters, with discrete mana whenua rights associated with the lands and resources of their respective districts.

While the signing of the Treaty of Waitangi brought an end to inter-tribal fighting in the Tamaki nui a Rua district, the Māori land purchasing policies of successive settler governments created divisions between Rangitāne hapū on both sides of the Tararua Range. The 'Forty Mile Bush' was first targeted by land purchase officials in 1856, when G. S. Cooper was sent to "ascertain the sentiments of the Natives" regarding its sale.[58] Although this initial foray was unsuccessful, two years later a deposit of £100 enabled Cooper's colleague William Searancke to obtain signatures from eight vendors purporting to sell to the Crown 115,000 acres centred on Ngaawapurua. The sellers were headed by prominent western Rangitāne leaders Hoani Meihana Te Rangiotū and Peeti Te Aweawe. In response, the eastern Rangitāne chief Te Hirawanu Kaimokopuna protested to government officials about

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[57] Refer to Appendix B1.4, Seventy Mile Bush Land Purchases Map.

[58] McBurney, P., "Tamaki-nui-a-Rua: Land Alienation Overview Report", CFRT, 2002, pp. 62-63; citing AJHR 1856, C.–1, No. 16. In his 1856 letter to Cooper, Donald McLean referred to the 'Forty Mile Bush'. Fifteen years later in 1871, the Crown purchased the 'Seventy Mile Bush', a great swathe of country south of the Manawatū River. Thus, the names 'Forty Mile Bush', and 'Seventy Mile Bush' were used interchangeably for the portions of the 'Great Bush' bush located in Hawke's Bay and Wellington Provinces. Ballara and Scott write: "The *Map of the Province of Hawke's Bay, New Zealand*, compiled and drawn from official sources by A. Koch, Wellington April 1874, shows the northern stretch of the Seventy Mile Bush (north of Manawatū) as the Forty Mile Bush. But *Wises New Zealand Guide*, 8th edition, p. 480, describes the portion of the forest lying south of Woodville as the 'forty-mile bush'. Wises is supported by Dollimore's *The New Zealand Guide*, 1957 edition, p. 137. J. G. Wilson supports the idea that the 'Forty Mile Bush' is the southern or Wairarapa stretch – *The History of Hawke's Bay*, p. 153." (Angela Ballara & Gary Scott, "Tamaki or The Seventy Mile Bush", (for Wai 201), 1994, p. 8, fn. 21). Be that as it may, when the Crown purchased an estimated 125,000 acres south of the Manawatū River, the sale was given the designation, the Seventy Mile Bush Purchase.

the sale, which he said was "in direct opposition to the expressed desire of the people resident on the land."[59]

The following year, at a large hui with Ngāti Kahungunu chiefs at Mataikona on the coast north of Castle Point, Donald McLean negotiated the purchase of the inland Ihuraua and Mākuri blocks. Although some of these chiefs, notably Hēnare Mātua, had links to hapū of Rangitāne, the sales took place without the consent of Te Hirawanu Kaimokopuna.[60] Following the introduction of the Native Land Court, these latter sales were recognised as having extinguished Native title, while the £100 advanced towards the Ngaawapurua 'sale' came to be seen as a deposit for the purchase of the Seventy Mile Bush, as the portion of bush lands in Wellington Province was known.[61] The cluster of bush blocks on the Hawke's Bay side of the provincial boundary was given the collective designation of 'Tamaki'.

In 1867, five of the Tamaki blocks, with a combined area of 65,555 acres (26,529.2 ha) passed the Court; each block was awarded to no more than 10 owners, as stipulated by the Native Lands legislation of the time.[62] However, apart from Karaitiana Takamoana, those put into the titles were all local chiefs and included Te Hirawanu, indicating a general consensus amongst the claimants as to the names to be entered for each block.[63] As negotiations for purchasing the Tamaki blocks had only just begun, the passage of the blocks through the Court was not followed immediately by alienation. When a dispute *did* arise between the claimants to the Tahoraiti block, it was resolved by partitioning the block between the contesting parties. Thus, the 1867 hearings were relatively uneventful and may be seen as a successful introduction of the Native Land Court to the Tamaki nui a Rua district.

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[59] 'Journal of James Grindell, Interpreter, N.L.P.D., from June 1st to July 31st, 1858'; in AJHR 1861, C.-No. 1, Enclosure No. 1 to No. 46, p. 277. It will be recalled that Ngaawapurua is situated at the confluence of the Mangatainoka and Manawatū Rivers, south-west of Woodville.

[60] Te Hirawanu was later paid £50 for his interest in the purchased blocks. McBurney, P., "Tamaki-nui-a-Rua: Land Alienation Overview Report", CFRT, 2002, p. 74.

[61] McBurney, P., "Tamaki-nui-a-Rua: Land Alienation Overview Report", CFRT, 2002, pp. 67-71.

[62] Although the Court was limited to making awards to no more than 10 owners under section 23 of the Native Land Court Act 1865, section 17 of the Native Lands Act 1867 required the Court to ascertain the identity of all owners interested in the block and enter their names on a register to be attached to the title. Chief Judge of the Native Land Court, F.D. Fenton objected to this requirement on the grounds that the purpose of the Court was to eliminate communal ownership. Hence, during Fenton's tenure as Chief Judge, which ended in November 1882, the requirement to include the names of all owners was not adhered to. See: "The Native Lands Act 1865", s. 23, 29 V. No. 71; and "The Native Lands Act 1867", s. 17, 31 V. No. 43; and commentary in: Bassett, Steel & Williams for the Crown Forestry Rental Trust, 1994 (1995 Update), pp. 33-37.4 & 46-48.3.

[63] Karaitiana Takamoana had family connections to the Tamaki nui a Rua district through his father, but was primarily affiliated to Ngāti Kahungunu and lived at Heretaunga (Napier/Hastings). He was brought into the Tamaki blocks on account of these whakapapa links, but also for his reputed skill in dealing with the Pākehā – he became a Member of the House of Representatives for Eastern Māori in 1871, serving until his death in 1879. He was also heavily in debt, and had been long before he was included in the titles of the Tamaki land blocks. He was obliged to sell his interests in these and other lands in which he was entitled in order to repay his creditors. Angela Ballara. 'Takamoana, Karaitiana', from the Dictionary of New Zealand Biography. Te Ara - the Encyclopedia of New Zealand, updated 30-Oct-2012.

However, tensions between residential non-sellers and non-residential chiefs prepared to sell large parts of Tamaki nui a Rua to the Crown re-surfaced in the early 1870s, when the remaining Tamaki and Seventy Mile Bush blocks came before the Native Land Court. Because of a disagreement between two local hapū, Hoani Meihana Te Rangiotū was brought in to support one side against the other on account of his superior knowledge of Rangitāne traditions and whakapapa. His intervention was decisive and he and his close relative, Peeti Te Aweawe, were rewarded with generous grants in the lands being adjudicated by the Court.[64]

## 2.2 The original Māori land blocks – the sites of the Woodville and Pahiatua STPs

### 2.2.1 Te Ahuaturanga Block (Woodville STP site)

The Woodville Sewage Treatment Plant is situated on the former Māori Land Court block named Te Ahuatūranga (estimated to contain 21,000 acres – 8,498.4 ha), which the Native Land Court investigated on 8 September 1870. Te Ahuatūranga is defined on its southern and eastern boundaries by the Manawatū River as it loops below Woodville before entering Te Āpiti (the Manawatū Gorge). Its western boundary is delineated by the tops of the Ruahine Range, while to the north it abuts the Maharahara and Oringi Waiaruhe blocks.

Hohepa Paewai told the Court that there were more than 66 owners; however, the Court's adherence to the 10-owner rule meant most owners had no chance of having their names entered on the title.[65] The only recourse for those likely to be left out of such a limited list was to lodge a counter-claim, which is what Aperahama Rautahi, Te Rōpiha Tākou and Wī Mātua proceeded to do. Aperahama's argument that the lists should be limited to those who actually lived and cultivated on the block was rejected by the Court, possibly on account of his stated opposition to land sales.[66] After a short hearing, the Court awarded Te Ahuatūranga to Nireaha Matiu (a.k.a. Nireaha Tamaki), Karaitiana Takamoana of Heretaunga, Heketa Te Awe, Wirihana Kaimokopuna (son of Te Hirawanu), Atenata Te Wharekiri, Hoani Meihana Te Rangiotū of western Rangitāne, and Herewini Te Whareraupō.

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[64] McBurney, P., "Tamaki-nui-a-Rua: Land Alienation Overview Report", CFRT, 2002, pp. 94-110.

[65] See footnote 61, above.

[66] McBurney, P., "Tamaki-nui-a-Rua: Land Alienation Overview Report", CFRT, 2002, p. 107. The partition hearing of the Tipapakuku block held in 1894 produced evidence that threw more light on the circumstances surrounding the title investigation of Te Ahuatūranga – see McBurney, "Tamaki-nui-a-Rua: Land Alienation Overview Report", pp. 289-298.

Te Ahuatūranga was included in the Crown's purchase of the Tamaki blocks in Hawke's Bay Province, by an agreement signed on 1 June 1871 involving a total area of 231,430 acres acquired for the sum of £16,000. After completing the purchase, the Crown made two reserves for Māori from the Ahuatūranga block: Ngaawapurua of 1,000 acres and Rotoahiri of 500 acres. These were subsequently combined to form a single reserve designated 'Section 200 Block 8 Woodville Survey District'.[67] The seven grantees placed in the Ahuatūranga title by the 1870 Court were named as owners of what became known as the Ahuatūranga Reserve, the surveyed area of which was later found to be 1,575 acres. In 1890, a timber lease was granted to Nelson Bros. sawmillers, who cut the millable timber off the block over a period of 21 years.

The Ahuatūranga Reserve later became the focus of a series of appeals to Parliament, with petitioners seeking to have the Native Appellate Court investigate whether the original grantees held the title in trust. The appeals were lodged by descendants of the many owners (as named by Hohepa Paewai) who had not been included in the title because of the law current at the time. The appeal process carried on over a period 10 years from 1900; in 1910 Cabinet decided that it could not disturb a 40-year old title and the final petition was rejected. By December 1912, the various parts of the Ahuatūranga Reserve had been sold either to the Crown or privately.

### 2.2.2 Manawatū-Wairarapa No. 2B Block (Pahiatua STP site)

The CVA proposal lists Manawatū-Wairarapa Nos 2, 2A, 2B and Ngatapu No. 1 as the site of the Pahiatua Sewage Treatment Plant. In fact, the Pahiatua STP site is specifically located on former Māori Land Court block Manawatū-Wairarapa No. 2B, also known as the Pahiatua Block.[68] At the 1871 title investigation, Manawatū-Wairarapa No. 2 was divided into three parts: No. 2, a.k.a. Mongorongo (15,000 acres – 6070.28 ha); No. 2A, a.k.a. Pukahu (6,000 acres – 2428.11 ha); and No. 2B, the aforesaid Pahiatua, estimated to contain 15,000 acres. The Pahiatua block is located between the Mākakahi/ Mangatainoka River system to the west and the Mangaone/Tiraumea River system to the east. The southern boundary of the Pahiatua block abuts the Pukahu block in the vicinity of Tūtaekara, while the Mangatainoka No. 4 block, also known as Pōhatu lies to the north.

The Wairarapa portion of the Seventy Mile Bush was heard by the Native Land Court sitting at Masterton in September 1871. Prior to the hearing, eastern Rangitāne hapū

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[67] Ibid., p. 182.

[68] Tamaki nui a Rua Overlay Map.jpg.

held a lengthy hui, at which they resolved to boycott the Court. Heavy rain had swollen the rivers, preventing many potential owners from attending, including the chief from Te Hawera, Nireaha Tamaki. In the months prior to the hearing, Hoani Meihana and Peeti Te Aweawe had been in negotiations with land purchase official, Samuel Locke, for the Crown to purchase the land following the title investigations. In spite of local opposition to both the hearing and the sale, Judge Rogan invited anyone present to put forward their claim, and Peeti Te Aweawe stood up to do so. Several locals protested, saying they would not participate in the Court. Having registered their protests, they refused to take any further part in the Court proceedings, which effectively cost them their landed interests.[69]

Title to the 15,000 acre Manawatū-Wairarapa No. 2B or Pahiatua block was awarded to: Huru Te Hiaro, Wi Takou, Tungane, Matiu Te Hinga, Akuria Takapo, Te Koeti Te Harakoa, Peeti Te Aweawe, Hoani Meihana, Ereni Te Aweawe and Rea Putara.[70] Two months after the title investigation, on 10 October 1871, a deed of sale was signed by Huru Te Hiaro, Peeti Te Aweawe, Hoani Meihana and 54 others, alienating to the Crown 120,631 acres of the Seventy Mile Bush, in ten blocks, for the sum of £10,000.[71]

As noted above, when the block was first investigated, no proper survey had been carried out; when this was finally completed, the block was found to be 7,625 acres larger than estimated. In 1896, a compensation case was held to determine to whom amongst the former owners an additional payment of £1,900 should be divided. In the event, the Court recognised the rights of both sets of claimants, although the eastern hapū received a proportionately greater share of the compensation than their western relatives.[72]

### 2.2.3 The Railway Act 1871 and the Seventy Mile Bush and Tamaki Blocks

The Crown's purchase of the Seventy Mile Bush and Tamaki lands was linked to Sir Julius Vogel's grand public works scheme, financed by the raising of an historic loan on the London markets.[73] The Public Works and Immigration Act, 1870 and its 1871 amendment were supported by a number of subsidiary Acts dedicated to particular

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[69] McBurney, P., "Tamaki-nui-a-Rua: Land Alienation Overview Report", CFRT, 2002, pp. 137-138; citing: Wairarapa Minute Book 2, pp. 1-6, 13 & 15.

[70] Robertson, Stephen, "The Alienation of the Seventy Mile Bush (Wairarapa)", CFRT, 2001, p. 77.

[71] Ibid., p. 82-87.

[72] McBurney, P., "The Seventy Mile Bush Reserves: Block Histories Report", CFRT, March 2001, pp. 26-29, 198-222.

[73] An initial loan of £3 million obtained in 1870 was set to increase to £10 million by 1876 and to an incredible £21 million by 1881. This did not occur; the Vogel-Fox Ministry lost power and the onset of the Long Depression in 1873 restricted access to money worldwide.

public works projects, which 'ring-fenced' the profit to be made from the resale of Māori land as a means of repaying the loan. For example, sections 8 & 9 of the Railway Act 1871 linked the cost of railway construction between Wellington and Hawke's Bay to the sale of land in the Tararua district.[74] The fourth schedule attached to the 1871 Act included the Manawatū-Wairarapa No 2 blocks in an area of approximately 296,000 acres between the Manawatū Gorge in the north, the Mangaone and Tiraumea Rivers in the east, Eketāhuna in the south and the Tararua Range in the west. Similarly, Te Ahuatūranga block was included in the fifth schedule of the Act relating to lands in Hawke's Bay Province whose sale would pay for that section of the railway.

The practice of buying Māori land cheaply and on-selling at a substantial profit in order to fund the colony's infrastructural development, sometimes known as the 'land fund model', has been addressed by the Waitangi Tribunal. Drawing on the evidence of Crown historian, Dr Donald M. Loveridge, the Wairarapa ki Tararua Tribunal states:

> The land fund model, as it operated in New Zealand, involved persuading Maori to accept that the Crown had an exclusive right of purchase and that they should sell their unused lands to it at relatively low prices. In return, Loveridge says, the Crown had to 'promise and deliver to Maori benefits above and beyond the immediate payments for particular blocks'. Those other benefits included roads, bridges, schools, hospitals, and mills that needed to be constructed to make a new society.
>
> In the model, even though the Crown would pay the lowest possible prices for Maori land, the apparent unfairness would be offset by the benefits, both indirect and direct, that Maori would receive from systematic colonisation. The land fund would pay for measures designed to assist Maori to cope with the stresses and strains caused by large-scale British settlement, the negative consequences of which had been observed in other colonial situations. It would also pay for the colony's infrastructure to be built, and Maori would benefit from this like everybody else.[75]

Citing Loveridge, the Tribunal reflects that by participating in the land fund model (that is, by alienating large tracts of land at a bargain basement price) Maori could expect to see a return on their investment. The Crown needed to do its part by delivering tangible benefits in the shape of "roads, bridges, schools, hospitals, and mills that needed to be constructed to make a new society".[76]

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[74] McBurney, P, "Tamaki-nui-a-rua: Land Alienation Overview Report", CFRT, December 2002, p. 172; citing: 35 V. No. 76. The Railway Act 1871, Sections 8 & 9; First, Fourth and Fifth Schedules. Section 8 charged the construction of the Wellington-Masterton section of the line against the portion of the Seventy Mile Bush within Wellington Province, while section 9 charged the construction of the Napier-Ruataniwha section against that part of the Seventy Mile Bush within Hawke's Bay Province.

[75] *Wairarapa ki Tararua Pre-Publication (Wai 863)*, "Public Works", Wellington, Waitangi Tribunal Report, 2009, p. 41.

[76] *Wairarapa ki Tararua Pre-Publication (Wai 863)*, "Public Works", Wellington, Waitangi Tribunal Report, 2009, p. 41.

In 1871, the Rangitāne chiefs had held back the 66,000-acre Mangatainoka block (Manawatū-Wairarapa No. 3) from the Seventy Mile Bush purchase, intending to use this land for their collective upkeep and on-going sustenance. However, Mangatainoka fell within the boundaries described in the fourth schedule of the Railway Act 1871, and land purchase officials were encouraged to purchase the interests of individual Māori owners. Over a period of forty years from 1873 until just before World War I, some 56,000 acres of Mangatainoka was alienated to the Crown or private interests.[77]

### 2.2.4 The Ngaawapurua Ferry – 1870s and 1880s

Despite having sold much of their land in the sales of the early 1870s, Rangitāne continued to live on whatever land and reserves they retained, while interacting with the ever-increasing settler population. One of the places such interaction occurred was at river crossings, particularly at Ngaawapurua, upstream from the Manawatū Gorge, where Rangitāne had long maintained kāinga. Ngaawapurua was on the route proclaimed for the main road following an ancient Māori ara (track).[78] The swift flow of the Manawatū swelled by its southern tributaries meant Māori assistance at the crossing point had been necessary since the first settlers arrived. Thus, for many years, the Rangitāne chiefs Huru Te Hiaro and Nireaha Tamaki ran a ferry service for travellers across the Manawatū and Mangatainoka rivers at Ngaawapurua,[79]

In 1877, the Government formalised this arrangement by agreeing to pay Huru and Nireaha £25 per annum to operate the ferry. Newspaper reports indicate that the decision did not sit well with local settlers, who resented having to rely on Māori who had, 'through some mistake', been put in charge of the only means of crossing 'dangerous rivers' through the southern portion of the Seventy Mile Bush.[80] For their part, Rangitāne had viewed themselves as kaitiaki of the river since long before the Crown took an interest in it, and the settlers' complaints rang with the indignity that Māori were 'lording it' over 'superior Englishmen'.

When the government vested authority for the Ngaawapurua ferry in the Wairarapa West County Council in 1880, the council was warned to respect the agreements already entered into with Māori. Despite such warnings, the council replaced Huru Te Hiaro as the official ferryman with a settler named Carver in June 1880. Huru

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[77] McBurney, P., "The Seventy Mile Bush Reserves: Block Histories Report", CFRT, March 2001, pp. 193-195.

[78] These routes are shown on an early plan of the area. See ML 88A.

[79] McBurney, P., "Tamaki-nui-a-Rua: Land Alienation Overview Report", CFRT, 2002, pp.159-164.

[80] *Wairarapa Standard*, 19 July 1879. The settlers were incredulous that Māori should assume a proprietary right to the river and resented their dependence on what they regarded as a 'grand system of extortion and imposition'.

refused to budge and the matter remained unresolved until well into the following year, when Huru and Nireaha agreed to a promised payment of £100 in exchange for relinquishing their claims to the ferry concession, as well as surrendering one acre of land for a ferry-house.[81] The government's failure to complete the deal and Māori expectations that they could continue to use the ferry without paying fares kept the issue alive for years to come. The struggle for control of the ferry service between Rangitāne and the settler community only ended when the Ngaawapurua Bridge was completed in 1885.[82]

By the early twentieth century, 95% of Rangitāne's ancestral lands had been sold, fatally undermining the tribe's economic base. Since then, much of the tribe's remaining land has also had to be sold to pay debts to local authorities (rates), Māori Land Court costs, or simply to pay grocery bills. Consequently, Rangitāne have been unable to benefit from the 'bargain' promised by the land fund model, with their economic fortunes severely reduced by this catastrophic land loss. Nevertheless, as a people they have endured and retain their ancestral legacy as tangata whenua of Tamaki nui a Rua (the Tararua district), which places the hapū of Rangitāne today under the same obligations as their tūpuna to exercise kaitiakitanga over this, their ancestral rohe.

[81] The 'Ferry Approaches' were gazetted on the northern, Te Ahuatūranga side in 1881 (*NZ Gazette* 1881, p. 1682).

[82] McBurney, "Tamaki-nui-a-Rua: Land Alienation Overview Report", 2002, pp. 161-164. The government only paid a deposit of £10 and Huru threatened to renege on the agreement unless he was paid the extra £90.

# Rangitāne Mana Whenua Today

## 3 Recent writings on Māori and the Environment

### 3.1 The Waitangi Tribunal on the Māori concept of territory

In the *Wairarapa ki Tararua Report*, the Waitangi Tribunal has commented on the Māori relationship to land in the context of the Tararua district and the tangata whenua. The Tribunal quotes evidence presented by Rangitāne kaumātua Manahi Paewai at Mākirikiri Marae in Dannevirke, who prefaced his kōrero with the whakatauki:

> 'Ko Ruahine te maunga.
>
> Ko Manawatū te awa.
>
> Ko Te Rangiwhaka-ewa te tangata.
>
> Ko Kurahaupō te waka.
>
> Ko Rangitāne te iwi.'[83]

The Tribunal noted that the connection with places – mountains and rivers – is recited before the connection with people. Elaborating on the Māori connection to the landscape, the Tribunal continues:

> The relationship between identity and place was expressed in many ways. Māori put marks on the land to establish their place there. Often, the most sacred marks were not spoken of in the Native Land Court, but they existed nevertheless. They may have taken the form of tūāhu (altars), pou (posts), or tohu (signs). Sometimes, the act of erecting these marks was very sacred; tūāhu were in this category, signifying the relationship between people and their most tapu (sacred) ancestors.
>
> But pou could often simply be indicators of a right to harvest a particular resource – berries, flax, and reeds – or a particularly rich bird habitat, serving to warn off others. Urupā (burial places) also related a people permanently to a place. People buried their dead only on land to which they had a right. The existence of urupā was therefore one of the primary ways of demonstrating take (legitimate claim) to land.
>
> Naming was another powerful expression of connection with land and dominion over it. The people and events associated with the name given would be synonymous with the place forever. Sometimes, the act of naming was for a particular purpose, perhaps to rāhui the land (set it aside on special terms as a no-go area, for a special purpose and for a fixed period). People expressed their identity through pepeha, waiata (songs), and kōrero (stories) that spoke of their

[83] Brief of evidence of Manahi Paewai, p. 2; in: *The Wairarapa ki Tararua Report*, Section 10.4 'Māori and the concept of territory', Wellington, Waitangi Tribunal, Wai 863, p. 821.

connection to the land. The more well-known the saying or song, the more irrefutable the connection celebrated by it.

Thus, we see that it was in the very nature of being Māori for a person to have an intense, lifelong – indeed, intergenerational – relationship with the area over which his or her hapū had mana.

Nor should it be supposed that the geographical area with which Māori interacted was necessarily small. Speaking of the nature of hapū, Angela Ballara, perhaps New Zealand's foremost expert on Māori social structure, wrote in her report for the central North Island inquiry:

> Hapū were of various sizes, strengths and degrees of unity. The largest, most powerful hapū did not usually (that is, in times of peace) live together in a single village or defend a single pā (fort). (Very few hapū, even the smallest, lived all together all the time in any one village – they all had multiple residences and small cultivations near their various resources for sustenance during economic tasks.)

This description is consistent with the evidence presented in this district inquiry.[84]

## 3.2 A schematic representation of the Māori cultural landscape

An extract from the 2002 publication *Whenua*, which covers the broad topic of environmental resource management from a Māori perspective,[85] conveys some of the guiding principles behind that perspective. In an article entitled "Planning for a Cultural Landscape", Miranda Sims and Michelle Thompson-Fawcett write:[86]

> Any landscape of historical importance for Māori is regarded as a landscape or site of cultural significance:
>
> > My forebears have fought over this land, they lived off it, fed off it, died on it, bled into it and are buried under it ... the whole area to me is Māori [local people]. That's my turangawaewae, my place to stand, because of the people who have gone before me.[87]
>
> The relationship described above between land and people is illustrated in [Figure 6]. The figure is not meant to be a static bounded image. Rather, it attempts to exemplify the fluid links between the spiritual, social, identity and resource aspects of life.
>
> Historically, Māori aimed to practise sustainable management of environmental resources for present and future generations. For example, Māori placed a protective ban (rāhui) on an area providing resources if they believed the

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[84] *The Wairarapa ki Tararua Report*, Section 10.4 'Māori and the concept of territory', Wellington, Waitangi Tribunal, Wai 863, p. 821.

[85] Merata Kawharu (ed.), *Whenua: Managing Our Resources*, Auckland, Reed, 2002.

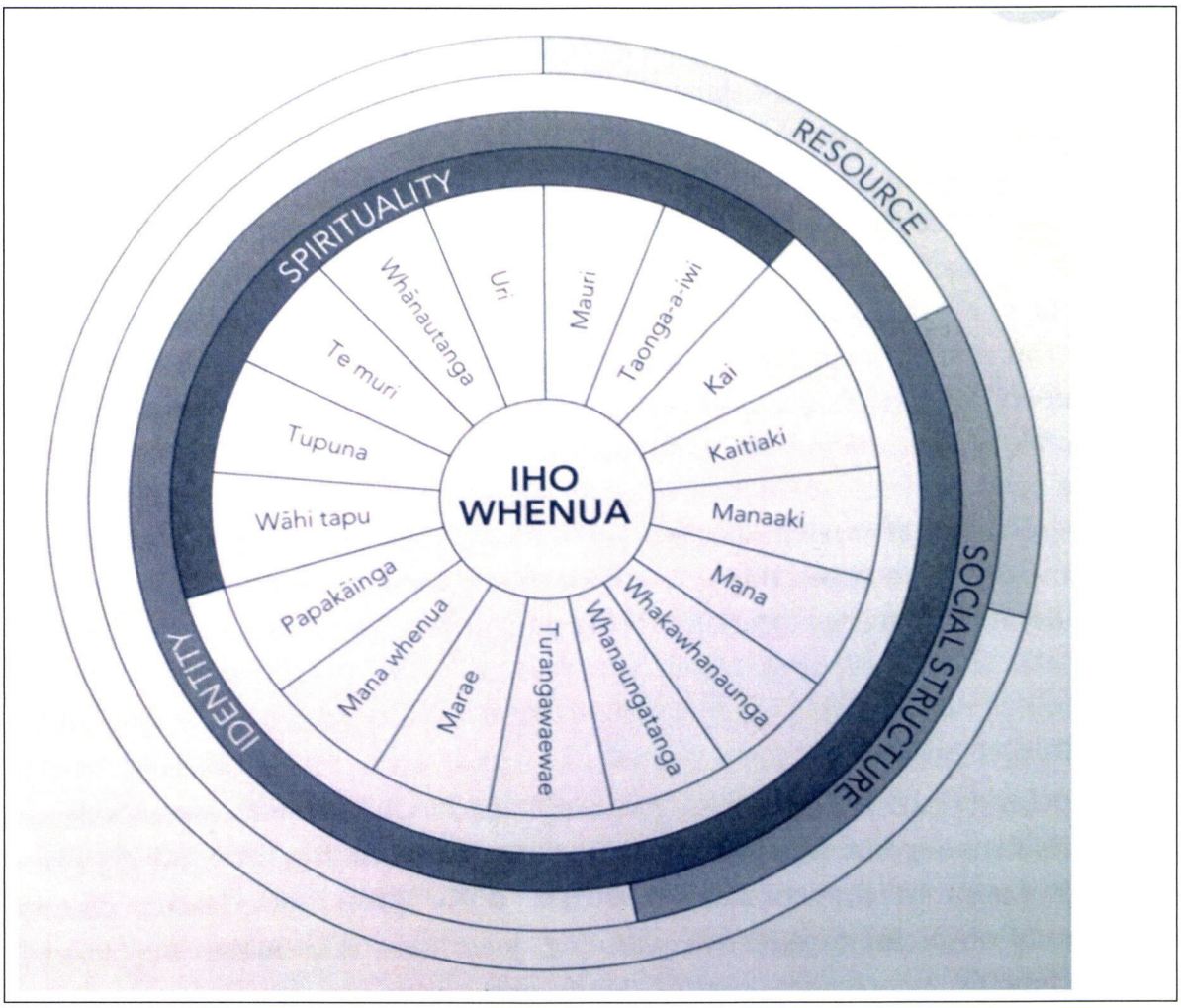
[86] Sims, M. & M. Thompson-Fawcett, "Planning for the Cultural Landscape", in Merata Kawharu (ed.), *Whenua: Managing Our Resources*, Auckland, Reed, 2002, pp. 262-263 (adapted from Challenger, 1988: 11).

[87] The citation for this quote is simply: "Māori elder, interviewed in present research".

resources were beginning to become depleted. Protective bans were placed on areas for contamination or conservation purposes prohibiting human activity occurring in the area for a certain length of time so resources could be replenished naturally.

Māori are also concerned to protect the spiritual life force of the natural environment. Any practice detrimental to the environment, such as effluent disposal into the ocean [or, indeed, into a river system such as the Manawatū], will not only degrade the environmental quality but also defile the sacredness and life essence of the locality. If the life essence is not completely intact, the resource will be unable to flourish to its full potential. These examples illustrate the integration of the spiritual and the physical.

**Figure 6: "Māori connections with the landscape"[88]**




[88] Ibid., p. 263 (adapted from Challenger, 1988: 11).

The writers continue:

> Depletion of scarce natural resources and pollution of the landscape subsequently affect the traditional practices and customs of Māori. Effluent polluting the sea [or river] causes the life essence to be defiled. Food gathering cannot be resumed until the life essence is restored. Any level of environmental degradation, therefore, has wider implications for Māori than merely the loss of a resource.[89]

These principles characterise the relationship between Rangitāne and their rohe in general; they also inform the specific response of Rangitāne and other hapū and iwi to the polluted state of the Manawatū River, which has come to public attention in recent years. The launching of Te Kāuru hapū collective dedicated to improving the condition of the river system in collaboration with local government and other interested parties is discussed next.

[89] Ibid., pp. 262-263.

# 4 Te Kāuru – Eastern Manawatū Hapū Collective

## 4.1 Background

The Tararua District Council's 2010 resource consent application (quoted in 'Appendix 1', below) refers to a 'significant shift in focus', marked by the signing of the Manawatū River Accord signalling a commitment 'to work collaboratively with other interested parties and landowners to jointly improve the water quality of the Manawatū River.'[90] This came about in response to a damning international report on the water quality of the Manawatū River published in 2009, which was widely reported in the media, as for example:

> The Manawatu River is one of the most polluted in the Western world, according to new research. The Manawatu tops a new pollution measurement of 300 rivers and streams across North America, Europe, Australia and New Zealand, research by the Cawthron Institute has found.
>
> The waterway is fouled with treated sewage, industrial waste and farm runoff.
>
> Under a system measuring oxygen changes in water, the Manawatu has by far the highest reading, almost twice as much as the next worst. The Manawatu measured 107. Anything over eight is considered indicative of an unhealthy river ecosystem. A measurement of 0–4 is considered healthy.[91]

The results surprised the ecologist who conducted the research, inasmuch as the closest pollution reading anywhere in the Western world was found at a river near Berlin, downstream from a sewage outfall, which scored 59. Dr Roger Young said the Manawatū was affected by leaching farm nutrient and treated town sewage, with agricultural use (particularly nitrogen runoff) the main culprit. His report noted that, "Other factors were the shallowness and width of the slow-moving river, which exposed it to sunlight that encouraged algae growth." The results also shocked Massey University ecologist Mike Joy, who said the research showed the river was "a basket case".[92]

Recognition of the plight of the Manawatū River galvanised hapū and iwi through whose rohe the river and its tributaries flow. In April 2010, hapū and iwi who have exercised mana whenua and mana moana on the eastern side of the Tararua and Ruahine Ranges since time immemorial joined forces to form Te Kāuru Hapū Collective. Representatives of Te Kāuru (which translates as 'The Source') signed the Manawatū River Leaders' Accord in July 2010. A planning process focused on

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[90] Tararua District Council, "Woodville Sewage Treatment Plant Resource Consent Application", September 2010, p. 4.

[91] Jon Morgan and Kelly Burns, "Manawatu River 'among worst in the West'," 26-11-2009, stuff.co.nz.

[92] Ibid.

'Manawatū River Action' took place between October 2010 and April 2011, and in July 2011 the Manawatū River Leaders' Action Plan was signed.

## 4.2 Te Kāuru Hapū Collective draft river management plan framework

In September 2012, wānanga were held across four marae: Rākautātahi Marae, Mākirikiri Marae, Te Ahu a Tūranga, and Te Kōhanga Whakawhāiti, the aim of which was to develop a draft river management plan framework.[93] Representatives from four iwi/hapū groups, Rangitāne, Raukawa, Ngāti Kauwhata and Muaūpoko, were invited to participate and participants came from Te Kāuru Eastern River Hapū Collective (Rangitāne), Ngāti Kauwhata and Raukawa. Points made at the wānanga included:

- This is a grassroots development – not a top-down development
- Kaitiakitanga (preservation) – not about ownership
- Manawatū River Action Plan – Te Kāuru specific actions and shared iwi/hapū initiatives (as detailed below)

The participants emphasised that they have a much bigger story to tell and were concerned about ensuring they would be listened to on their own terms, rather than having their kōrero interpreted by others.

In accordance with the guidelines cited above, the draft river management plan provides a framework for river hapū to develop their own plans, acknowledging that these would be living documents that would evolve over time. The hapū plans may take various forms – written, visual or other – that resonate most with each hapū. They can be in te reo Māori or the English language. However, actions shared with non-Māori landowners, community or agencies, etc. will be expressed in plain English. Where there are no active hapū to develop a river management plan, an iwi or hapū collective may step into the role of developing a plan. The plans' contents will incorporate the themes identified during the wānanga of 7-8 September 2012: Te Karanga a te Awa – Kaitiakitanga.[94]

**Te Karanga a te Awa** may be seen as an invocation of the sacred spirits of the river. It is analogous to the karanga or call of welcome, uttered by senior women specially chosen for the role of kai karanga, inviting visitors (manuhiri) to advance onto the marae. The keening call of the karanga arouses the spirits of those who have

[93] Power point presentation Re: Wānanga at Rangimarie Marae held on 10 December 2013, 'Update by Te Kāuru of the River Management Planning Framework'.

[94] Ibid.

passed on to the spirit world, so that both the marae and manuhiri become tapu or sacred. After the pōwhiri or ceremonial welcome, tangata whenua and manuhiri hongi and consume food, rendering the visitors noa and free from the ritual sacredness. This process is encapsulated in the pepeha (proverb):

> He wahine te kaitohu i te tapu;
>
> He wahine hoki te kaiwhakanoa i te tapu.
>
> A woman instigates the sacred; a woman dissipates the sacred.[95]

**Kaitiakitanga**, broadly defined as guardianship, also reflects a spiritual view of the world. It derives from the term 'kaitiaki', which Dr Cleve Barlow describes as:

> Kaitiaki or guardian spirits are left behind by deceased ancestors to watch over their descendants and to protect sacred places. Kaitiaki are also messengers and a means of communication between the spirit realm and the human world. There are many representations of guardian spirits, but the most common are animals, birds, insects and fish.[96]

In terms of Rangitāne and the Manawatū River, Kaumātua Manahi Paewai comments:

> Rangitāne know of many taniwha and Kaitiaki along the course of the river. One of these is Peketahi, the Kaitiaki in the bend of the river known as the 'Kanihi" near Kaitoki bridge east of Dannevirke. He has also been known to traverse the Manawatū River to the west where he has a lair at Motuiti near Foxton. Peketahi appears in the form of a crayfish (koura) with a missing limb, an eel (tuna) or a log (poro rākau). In times of flood Peketahi is often seen as a floating log as he keeps watch over people as they swim and on the kainga.
>
> Other Kaitiaki of Tamaki nui a Rua are Ruamano, Mohongaiti and Whāngai-mokopuna, but there are others.[97]

The Resource Management Act 1991 defines kaitiakitanga as "the exercise of guardianship by the tangata whenua of an area in accordance with tikanga Maori in relation to natural and physical resources; and includes the ethic of stewardship."[98] Anthropologist Dr Merata Kawharu observes that the concept of kaitiakitanga is more nuanced than simply guardianship:

> *Kaitiakitanga* should be defined not only as 'guardianship' as has been emphasised by the Crown, local government and some Maori, but also as 'resource management'. *Kaitiakitanga* embraces social and environmental dimensions. Human, material and non-material elements are all to be kept in balance. Current use of *kaitiakitanga* has tended to emphasise conservation and protection.

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[95] Barlow, Cleve, *Tikanga Whakaaro: Key concepts in Māori culture*, Auckland, OUP, 1991, pp. 38-39.

[96] Ibid., p. 34.

[97] Manahi Paewai, written feedback to draft report, by email, 26 November 2014.

[98] Section 2, RMA, 1991. NZ Statutes, No. 69, 22 July 1991.

And further:

> *Kaitiakitanga* cannot be understood without regard to key concepts including *mana (rangatiratanga)* 'authority', *mauri* 'spiritual life-principle', *tapu* 'sacredness, set apart', *rahui* 'prohibition or conservation', *manaaki* 'hospitality' and *tuku* 'transfer, gift, release'.[99]

Dr Kawharu adds:

> [*Kaitiakitanga*] incorporates a nexus of beliefs that permeates the spiritual, environmental and human spheres: *rangatiratanga, mana whenua* 'customary authority over, and of, land', *tapu, rahui, hihiri* and *mauri* 'life principle'. *Kaitiakitanga* also embraces social protocols associated with hospitality, reciprocity and obligation (*manaaki, tuku* and *utu*). These beliefs are moulded with, and by, each generation for they have an important role in maintaining the social fabric of the kin group. Moreover, *kaitiakitanga* is a fundamental means by which survival is ensured—survival in spiritual, economic and political terms. Since Maori society is a tribal society with respect to relationships with environmental resources, their actual management is itself a constituent element in the tribal kinship system.[100]

Inasmuch as the environment and resource management are issues that concern society as a whole, Kawharu argues that kaitiakitanga does not exclude mainstream institutions, processes, values or paradigms.

> To the contrary, *kaitiakitanga* has become a major binding force between Maori and non-Maori. Legal and political requirements to develop *kaitiakitanga* policy have resulted in a new platform from which bicultural relationships between Maori and non-Maori can be fostered, common concerns of resource management addressed and specific rights of all parties protected. "Partnership" is a common principle underpinning Maori/non-Maori relationships. And a Treaty-based partnership as a Treaty principle has been established in major court cases (see for example, New Zealand Maori Council v Attorney General [1987] 1 NZLR 641) and by the Waitangi Tribunal. Partnership is further embraced by the RMA 1991, particularly through Part II, Sections 7(a), 6(e) and 8.
>
> Before the RMA 1991 was enacted, few examples can be found of local tribal groups and non-Maori specifically considering the term *kaitiakitanga* despite its philosophical foundation having had longstanding significance. However, the term now finds prominence in local government policy statements (albeit in a limited sense in some council policies), tribal environmental policy statements and Environment Court cases as a result of compliance with the RMA 1991 and other relevant resource legislation.[101]

These issues are discussed further in section 5, below.

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[99] Kawharu, Merata, "Kaitiakitanga: A Māori anthropological perspective of the Māori socio-environmental ethic of resource management", in JPS, Vol. 109 (No. 4), 2000, p. 349.

[100] Ibid., p. 351.

[101] Ibid., p. 354.

Te Kāuru River Management Planning Framework provides the following guidelines for its constituent hapū to consider when developing the twin themes of Te Karanga a te Awa and Kaitiakitanga:[102]

| Te Reo Māori | English Translation |
|---|---|
| 1) Whanaungatanga ki te Awa – ā whanau, ā hapori Rangatahi – ki te awa<br>• Matauranga<br>• Putaiao<br>• Waiata | 1) Relationship to the river – family, community, youth – to the river<br>• For education<br>• To teach and learn science<br>• Songs with historical reference |
| 2) Waiora<br>• Whakaora<br>• Iriri<br>• Rongoa | 2) Living Waters<br>• To heal<br>• To initiate / Baptise<br>• For medicinal purposes |
| 3) Te reo o te Awa<br>• Rauemi<br>• Tātai kōrero<br>• Whitiata<br>• Waiata<br>• Kōhanga/Kura Kaupapa<br>• Kura Auraki | 3) The River's voice<br>• Educational resources<br>• Historical narrative<br>• Video<br>• Songs<br>• Kōhanga/Kura Kapupapa<br>• Mainstream Schools |
| 4) Te reo o te tangata<br>• Kōrero tahi<br>• Momo rākau<br>• Mahi Ngātahi<br>• Rongoa<br>• Mātauranga<br>• Whakaako | 4) People's voice<br>• Discuss together<br>• Tree species for planting<br>• Collaboration on projects<br>• Medicinal focus<br>• Education<br>• Teaching each other |

[102] Power point presentation Re: Wānanga at Rangimarie Marae held on 10 December 2013, 'Update by Te Kāuru of the River Management Planning Framework'.

| | |
|---|---|
| • Whāngai atu<br>• Aroturuki<br>• Matakite | • Sharing knowledge<br>• Monitoring<br>• Use of visionary people |
| 5) Māra kai<br>Mahinga kai } Pātaka | 5) Food Source<br>Gathering } Foodstore |

Hapū have been invited to incorporate their own plans within the framework having regard to a 'source to sea' introductory overview, the shared vision and goals of Te Kāuru, and references to the Resource Management Act 1991 as governing legislation. Each hapū plan should provide an historical narrative and description of the rohe, an assessment of the state of the river in cultural terms today, a vision of where it needs to be in future, a list and description of sites of significance and proposals for projects designed to achieve these goals.

Under the heading, 'Building on the Manawatū River Leaders' Accord', the planning framework expresses the vision and goals as:

**The Vision**

- Ki te ora te kāuru, ka ora te rere, ka ora āno te pūaha.
- If the source of the river is healthy, so should its collective flow, even to the sea.

**The Goals**

- The Manawatū River becomes a source of regional pride and mana
- Waterways in the Manawatū are safe, accessible, swimmable, and provide good recreation and food resources
- The Manawatū catchment and waterways are returned to a healthy condition
- Sustainable use of the land and water continues to underpin the economic prosperity of the region.

With regard to particular kaitiaki responsibilities, designed to return the river environment to health (waiora) Te Kāuru management framework plan stipulates:

- Keep all waste (solid and liquid) out of food-producing water bodies
- Where possible, restore native vegetation and wetlands to cloak the river and provide habitat
- Respect regeneration capabilities when collecting mahinga kai

It is noted that 'river' is not limited to the Manawatū River itself, but applies to all its tributaries and smaller bodies in its catchment.

The management framework plan provides a detailed prescription for each hapū to follow in developing plans for river recovery in their rohe.

This CVA will now turn to the hapū affected by the Woodville and Pahiatua Sewage Treatment Plants, providing historical narratives for each and their links to the land and the river.

# Legal Rights & Obligations – the RMA (1991)

## 5 The Resource Management Act 1991 and the Principles of the Treaty of Waitangi

### 5.1 Protection of tangata whenua interests in the RMA

The Resource Management Act 1991 (the RMA) is one of a cluster of laws enacted since the passing of the Treaty of Waitangi Act 1975 that makes reference to the 'principles of the Treaty of Waitangi', initially seen in the preamble of the TOW Act 1975.[103] The latter legislation marked a turning point; after more than a hundred years of laws directed towards separating Māori from their land, or managing the inevitable effects of Māori landlessness and economic marginalisation, the 1975 Act gave belated recognition to the undertakings contained in the Treaty, particularly Article Two.[104]

However, incorporating the Treaty into legislation has not been a simple matter. As Richard Boast writes, inasmuch as New Zealand law is based on the Common Law of England, the status of the Treaty of Waitangi is determined by what English common law says about treaties in general. Thus:

> In English law, treaties are regarded as international dealings which must be enforced in international law. They cannot be enforced *domestically* unless they are given effect to in a statute. So the Treaty of Waitangi, as it is certainly a treaty, is an international instrument; but only if it is incorporated in an Act of Parliament can it be enforced in the internal courts of New Zealand.[105]

The dichotomy between the Treaty as an international instrument and its recognition as a formal part of the laws of New Zealand, albeit to a strictly limited degree, has

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[103] Preamble, "Treaty of Waitangi Act 1975" (1975, No. 114). Other Acts referring to the principles of the Treaty include: Environment Act 1986 (1986, No. 127); Conservation Act 1987 s.4 (1987, No. 65); and Crown Minerals Act 1991 (1991, No. 70).

[104] The Treaty of Waitangi comprises three articles. The version signed by most Māori was in te reo Māori, a recent translation of which states: "First Article - The chiefs of the Confederation and all the chiefs who have not joined that Confederation give absolutely to the Queen of England for ever the complete government over their land. Second Article – The Queen of England agrees to protect the chiefs, the subtribes and all the people of New Zealand in the unqualified exercise of their chieftainship over their lands, villages and all their treasures. But on the other hand the chiefs of the Confederation and all the chiefs will sell land to the Queen at a price agreed to by the person owning it and by the person buying it (the latter being) appointed by the Queen as her purchase agent. Third Article – For this agreed arrangement therefore concerning the government of the Queen, the Queen of England will protect all the ordinary people of New Zealand and will give them the same rights and duties of citizenship as the people of England. John Wilson. 'Nation and government - The origins of nationhood', Te Ara - the Encyclopedia of New Zealand, updated 22-Sep-12.

[105] Richard Boast, "Treaty of Waitangi and Environmental Law", in Christopher D A Milne (ed.), *Handbook of Environmental Law*, Wellington, Royal Forest and Bird Society of New Zealand, 1992, p. 247. *Emphasis* in original.

been resolved through the development of a set of principles that recognises a partnership between the Crown and Māori and sets out the parameters of that partnership. Apart from the aforesaid TOW Act 1975, the State-Owned Enterprises Act 1986 contained "one of the most forceful enactments of the Treaty into statutory law. Section 9 states that 'nothing in this Act shall permit the Crown to act in a manner that is inconsistent with the principles of the Treaty of Waitangi'."[106]

In terms of giving legal force to the principles of the Treaty, the RMA has been most significant on account of its impact on the everyday management of resources. Boast observes:

> Prior to this Act, there were very few statutory requirements to have regard to Maori interests in resource management decisions. Resource managers will now have to develop relationships with hapu and iwi in order to discharge the consultative obligations that the Act imposes.[107]

The RMA contains a number of sections that require the Environment Court to consider issues of particular relevance to Maori. These include, in Part II of the Act:

> s6: In achieving the purposes of this Act, all persons exercising functions and powers shall provide for the following matters of national importance: [including] e) the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga.
>
> s7: All persons exercising functions shall also have particular regard to a) kaitiakitanga...[108]
>
> s8: All persons exercising functions 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).[109]

Section 104 of the RMA sets out the principal matters which any consent authority must have regard to when considering an application for consent. Although the principles of the Treaty are not referred to directly in this part of the Act, s.104(4)(g) requires the consenting authority to have regard to Part II of the Act, including ss.6, 7 & 8, as described above, when considering an application for consent.

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[106] Ibid.

[107] Ibid., p. 248.

[108] Kaitiakitanga is the first of eight matters listed in section 7 that 'persons exercising functions' must have particular regard for. Dr David Williams et al. state that kaitiakitanga as defined by the Act equates to the exercise of guardianship, but note that: "Although kaitiakitanga is a Maori concept, the ethic of stewardship is not confined to Maori specifically and indeed the Planning Tribunal has since held it to be a wider concept." "Resource Management Act, 1991" (1991 No. 69), Part II, s. 7. Dr David Williams, Heather Bassett & Rachel Steel, *The Maori Land Legislation Manual: Te Puka Ako Hanganga Mo Nga Ture Whenua Maori*, CFRT, 1994, (Reprint 1995).

[109] (1991 No. 69), Part II, ss.6, 7 & 8.

## 5.2 The Principles of the Treaty of Waitangi

The principles of the Treaty have not been defined by legislation. They are referred to in publications of various government agencies and discussed by the Waitangi Tribunal in its reports; however, these are not legally binding, offering guidelines and recommendations only.[110] Richard Boast observes that decisions of the Courts, and in particular the Court of Appeal decision in *New Zealand Maori Council* v. *Attorney General*, are the most authoritative in defining a set of principles of the Treaty.

While the Court of Appeal noted that its list was not exhaustive, it promulgated three main Treaty principles:

- Partnership and reasonable cooperation
- Active protection
- Consultation

In terms of the first of these, Boast writes:

> A partnership exists between the Crown and Maori. It implies a duty on both the Crown and Maori to act towards each other in good faith but the concept does not imply equal partnership. In terms of the Resource Management Act this means that the views of Maori must be heard but that they may not necessarily be reflected in the actual result of the decision making process....The Court noted that the duty to act in utmost good faith involves acting reasonably and is a two way street.[111]

Inasmuch as environmental management is a task often carried out at local government level, this implies a delegation of the Crown's Treaty partnership obligations to local authorities.

On the second point, Sir Robin Cooke, President of the Court of Appeal ruled "the duty of the Crown is not merely passive but extends to *active protection* of Maori people in the use of their lands and waters to the fullest extent practicable"[112]. Boast observes, and it is relevant in terms of sewage treatment plants:

> Of course the principle of active protection must be balanced against the rights and duties implicit within the principle of partnership. For example, it is obvious that hazardous wastes must be administered under a legal regime which speaks for all citizens in all situations.[113]

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[110] Boast, "Treaty of Waitangi and Environmental Law", 1992, pp. 248-249.

[111] Ibid., p. 249.

[112] Ibid., citing *New Zealand Maori Council, p. 664.*

[113] Ibid., p. 250.

This caveat was also raised by Mrs Hanatia Palmer during the interview conducted for this project, when she pointed out that community health and the efficient disposal of effluent was of primary importance.[114]

The Court of Appeal decided that the third point regarding consultation should depend on context; that is, it should be treated on a case-by-case basis. A general rule is that the more consultation with hapū and iwi is engaged in, "the less likely a local authority or government agency will be found to have breached its statutory obligation to comply with the 'principles' of the Treaty of Waitangi".[115]

## 5.3 Rangitāne O Tamaki nui a Rua and local authorities

Rangitāne O Tamaki nui a Rua have dealings on RMA issues with two local authorities in their rohe: the Tararua District Council and the Horizons Regional Council. The former is the governance body for the Tararua District, while the latter has responsibility for a vast region covering the Tararua, Manawatū, Horowhenua, Rangitīkei, Wanganui and Ruapehu districts, as well as Palmerston North City and part of the Waitomo, Taupō and Stratford districts.

Section 30 of the RMA sets out the functions, powers and duties of local authorities under the Act and it is in the councils' performance of these tasks that the Treaty partnership with Rangitāne should be given expression to. It is fair to say that for many years this occurred sporadically, or not at all, as all parties developed the capacity and capability to respond to the requirements of the Act. Rangitāne members involved at that time remember:

> Tararua District Council at that time did not have the same dedication to this section as Iwi, due to a lack of confidence in this area. However Rangitāne had a good relationship with the then Mayor and staff at the time, so were able to be at the table on a range of matters. We had no voting rights but most importantly, we saw every consent that came to council and could be part of the discussion. Had this relationship not been already in place, Council would not have consulted with Māori in those early days.[116]

Mrs Lorraine Stephenson was appointed the responsibility of matters concerning Land, Conservation and the Environment by Rangitāne O Tamaki nui a Rua in the 1990s, although as no funding was available, the role was undertaken on a voluntary basis.

Lorraine Stephenson states:

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[114] Interview with Hanatia Palmer, Rangitāne o Tamaki nui a Rua Offices, Dannevirke, 21 August 2014.

[115] Boast, "Treaty of Waitangi and Environmental Law", 1992, p. 250.

[116] Written feedback to draft report, 26 November, 2014.

> In 1991 when the RMA Act was being introduced I attended the very first Hui for Maori consultation. From then on I never missed an opportunity to upskill myself. I was appointed to the Resource Management Committee in Tararua District Council. Council paid for some training but the rest of my work for them was voluntary. Rangitāne were the only Iwi doing business with Council. I developed the same relationship with Manawatu/Wanganui Regional Council during this period. They were a lot more accepting of my ability and for 10 years I chaired their 13 Iwi forum called Te Roopu Awhina. I was appointed to the Regional Council RMA Committee. I, with two other Māori, undertook Hearing Commissioner Roles. This work I still do today. We were paid meeting fees and I was paid Commissioner fees. This hardly paid for the ink required for all the work and effort needed to work at this level. Rangitāne never paid me for this work. I paid all my travel, accommodation and training. Rangitāne had no money for this work in those days. We have solid history here that proves that we take our role as Kaitiaki very seriously. I found it to be very lonely work.[117]

Mr Roger Pearse succeeded Lorraine in the position from 2006 till 2009. Since he passed away in 2009, his daughter Mrs Hineirirangi Carberry has been RMA Officer for Rangitāne. Since August 2011, Hine has been employed by Rangitāne on a part time basis predominantly to undertake RMA activity.

Local authorities' awareness of their obligations to consult with Rangitāne under the RMA has been less than ideal. As recently as 2010, Rangitāne became aware of an application to renew a resource consent for gravel extraction with respect to the "Upper Manawatū and Lower Mangahao Rivers". A call was put in to Horizons Regional Council, whose representative responded by asking whether Mrs Carberry was an adjacent land owner, and therefore able to be classified as an 'affected party'. When told she was not, the representative pointed out there was no obligation on the part of the council to notify the Iwi.

The relationship between Rangitāne and the Regional Council has improved markedly since the adoption of the Manawatū River Leaders' Accord, inaugurated in 2010. The Accord was confirmed by a "Memorandum of Partnership" between Te Kāuru Eastern Manawatū River Eastern Hapū Collective and Horizons Regional Council (HRC) signed by Rangitāne in 2012, which has formalised at the local level the provisions contained in the RMA. It is not a perfect system; resourcing iwi participation can still be an issue, although some applicants for resource consents have contributed to iwi participation in the RMA process. Where cultural value assessments are required, the applicant generally foots the bill. The Tararua District Council is paying for the current CVA report for the Woodville and Pahiatua STPs.

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[117] Lorraine Stephenson, written feedback via email, Wednesday 26th November 2014

Rangitāne stress the importance of building robust relations between local authorities and tangata whenua to bolster the Partnership aspect of the Treaty Principles, from which proactive Consultation and Active Protection can follow. As noted above, kaitiakitanga embraces an holistic set of cultural values, including ancestral links with the past and with the landscape (identity), whānau ora, wairua and mana whenua. While these qualities are not dependent on an Act of Parliament, the provisions of the RMA are important in terms of the protections they afford tangata whenua, in allowing them to exercise kaitiakitanga within their ancestral rohe. It is an on-going conversation – it doesn't end with the granting of consents. An important finding of this CVA is the need for a commitment on the part of the local authority to maintain regular contact with tangata whenua representatives, with a no-surprises policy on any issues arising.

Hine Carberry states:

> [The RMA] is totally and absolutely important; we are doing this work because we want to do exactly that. This is our rohe, we are the rightful ones to be responding with regards to environmental issues and consents. We know this area, we are passionate about our connection to our whenua and moana. Through the RMA process we have been able to utilise it to maintain/assert our mana.[118]

[118] Hineirirangi Carberry, written feedback via email, 26 September 2014.

# Consent Applications for the Woodville and Pahiatua STPs

## 6 Site examinations of the Woodville and Pahiatua STPs

On Friday 22 August 2014, the author was hosted by Ms Hineirirangi Carberry, Resource Management (RMA) Officer for Rangitāne O Tamaki nui a Rua, on site visits of the Woodville and Pahiatua Sewage Treatment Plants. There we met with Mr Dave Watson and Mr Eric Bonny, Utilities Manager and Utilities Engineer respectively for Tararua District Council. Mr Bonny and Mr Watson showed me around both sites and explained the operating systems of the treatment plants in great detail.[119]

The Woodville Sewage Treatment Plant is situated approximately 1.2 kilometres southwest from the centre of Woodville within rural land situated between Station Street and Troup Road West. After crossing the railway line at the end of Station Road, access to the site of the treatment plant is via a long right of way. The gravity-fed main sewer line from Woodville Township delivers waste to the treatment plant where it is initially pumped through a filtering screen to separate out the solids. These are passed through an auger to compress them before being compacted and trucked away for disposal in a landfill. The liquid effluent flows into the oxidation pond system, consisting of a series of four ponds. Pond number one has an aerator which places an air curtain across the pond to assist with circulation, improve the oxygen level and help break down the effluent. Pond number two, which has recently been re-lined, contains a series of baffle curtains (like tennis nets) to ensure the effluent follows a zigzag path through the pond allowing time for it to break down. The effluent then goes into two smaller maturation ponds; from there, it passes through a clarifier where an organic coagulant is added that attracts any remaining suspended solids including phosphorous, which precipitate out. The effluent passes through a drum filter before being subjected to ultraviolet light. At the end of the process, the treated effluent is discharged into an un-named creek that discharges into the Mangaatua Stream.

It is understood that the current consent application relates to the upgrading of the Woodville Plant to allow for a gravity-fed process which will reduce the need for pumping effluent around the system. In particular, a new filtering screen will be fully gravity-fed, saving the cost of pumping through the screening chamber at the

[119] The narrative about the operation of the Woodville Sewage Treatment Plant is based on a digital audio recording made during this site visit, and a subsequent telephone conversation with Mr Bonny on 14 November 2014. Mr Watson and Mr Bonny provided feedback on a draft of this section of the report describing the operation of the STPs, which has been incorporated into the final report.

beginning of the process. There are also plans to diffuse the final discharge directly into the Mangaatua Stream, bypassing the unnamed tributary currently in use. The Council indicates that they are also "pursuing the final effluent polishing by passing through a land based tephra filter (organic volcanic ash sourced from the central plateau) prior to the final discharge. Also a rock filter diffuser will be erected at the stream bed discharge point."[120]

The Pahiatua Sewage Treatment Plant is located at the north western edge of Pahiatua Township, with access from Julia Street. The treatment plant comprises three ponds, with a final discharge at the time of the site visit (August 2014) into a small tributary creek feeding into the Mangatainoka River. As with the Woodville STP, the Pahiatua plant is in the process of being up-graded, with a new filter screen about to be installed and additional stages included in the treatment process. Already, new aerators have been installed in ponds one and two.

Under the new system, after passing through all three ponds, the effluent will be pumped from the south-western corner of pond three back to a new treatment facility on the higher ground at the end of the access right of way. There it will enter a contact tank in a gravity-fed system where the effluent will be treated with organic coagulant to remove suspended solids (including phosphorus); it will then pass through a drum filter and clarifier to a chamber where the sewage will be treated with ultraviolet light. Initially, the treated waste will be discharged into the same creek feeding into the Mangatainoka River. It is proposed, however, that when the Pahiatua Town water supply is upgraded to a bore system, the current pipe and filter that takes water from the Mangatainoka River for the town supply will be used instead for discharging the treated waste directly into the Mangatainoka River, bypassing the tributary altogether.

Eric Bonny and Dave Watson are working to ensure the sewage treatment plants administered by the Tararua District Council meet the highest standards of purification in New Zealand; already, the systems they have put in place deliver markedly better outcomes than other jurisdictions. Their objective is for the discharge from the Woodville and Pahiatua Sewage Treatment Plants to be demonstrably cleaner that the river water it is discharged into. While this has been achieved, their efforts are compromised by the fact that the river is subjected to pollutants from other (agricultural) sources, which means it fails to comply with the standards imposed by Horizons Regional Council.

Although Rangitāne O Tamaki nui a Rua appreciate these efforts, they fully support the kaupapa of Te Kāuru (Manawatū River Eastern Hapū Collective), which holds that no treated waste from sewage treatment plants should be discharged into the

[120] Dave Watson, Pers. Comm. by email, 17 November 2014.

Manawatū River system. Rather, a ground-based dispersion system should be utilised wherever possible. Rangitāne understand, however, that the prospects for a ground-based dispersion system are limited by the cost and availability of suitable land that would accommodate such a system.

# 7 Conclusions

Three hapū of Rangitāne O Tamaki nui a Rua have exercised mana whenua over the lands and waterways within which the Woodville and Pahiatua Sewage Treatment Plants are situated: Ngāti Mutuahi at Woodville and Ngāti Te Koro and Ngāi Te Kapuārangi south of the Manawatū Gorge where the impacts of the Pahiatua Sewage Treatment Plant are felt.

In terms of the Woodville and Pahiatua STPs, there are positive signs that the protections for Māori cultural values contained in the Resource Management Act 1991 are being implemented. The 'partnership' between Rangitāne and the local authorities is now on a formal footing and the consultation requirement for the STPs has been met; Tararua District Council staff were very cooperative in meeting with the Rangitāne RMA Officer Ms Carberry and the present writer on site at the Woodville and Pahiatua treatment plants. Mr Watson and Mr Bonny went to great lengths to explain the waste treatment process in terms that we as lay-people can understand and the effects of the discharge on the environment.

The active protection requirement is more problematic, insofar as the ideal outcome for Rangitāne is that treated wastewater should not be discharged into the river system. It is acknowledged that in effect, the wastewater coming out of the treatment facilities contains fewer pollutants than the river system it is discharged into. Nevertheless, in cultural terms, it is essential that even thoroughly treated human waste is not discharged into the river. It is understood that the Council is operating within constraints of funding and resources and that land based discharge would be both prohibitively expensive and difficult on account of a lack of suitable terrain. As a founding member of Te Kāuru, Rangitāne O Tamaki nui a Rua fully support the kaupapa of nil pollution as the final aim.

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# Appendix 1 Consent applications for the Woodville and Pahiatua Sewage Treatment Plants

## A1.1 The Applicant (the Tararua District Council)

The consent renewal application lodged by the Tararua District Council states:

> The Tararua District Council is the territorial authority for a large land area (424,000 hectares) that extends from Mount Bruce at the southern boundary to just north of Norsewood at the northern boundary, and from the Tararua and Ruahine Ranges to the Pacific Coast. ... The Manawatu River and five of its major tributaries flow through the district and are highly valued for the resources and recreational opportunities that they provide the wider community and local economy. Numerous smaller tributaries of the Manawatu River also originate within the District, several of which are used by Tararua District Council for water supply purposes and for the discharge of treated wastewater. The provision of a reticulated sewerage system is integral to the functioning and health of any community and Tararua District Council is therefore committed to providing this service to its residents, whilst ensuring a balance between minimising adverse effects of domestic wastewater discharges on waterways and not overly burdening the District's ratepayers. Tararua District Council has recently signed the Manawatu River Accord and this has marked a significant shift in focus to Council being committed to working collaboratively with other interested parties and landowners to jointly improve the water quality of the Manawatu River.[121]

## A1.2 The Woodville Sewage Treatment Plant Site

The description of the Woodville Sewage Treatment Plant site on the Tararua District Council's Resource Consent Application is as follows:

> The Woodville Sewage Treatment Plant is situated approximately 1.2 kilometres southwest from the centre of Woodville within rural land situated between Station Street and Troup Road West, legally described as Lot 1 DP 22349 (CT HB P2/146), and Lot 6 DP 28374 (CT HB Y2/131). The site currently contains four ponds - two oxidation ponds and two smaller maturation ponds. A small-modified unnamed tributary of the Mangaatua Stream flows from the north past the eastern extent of Pond 1 and through a paddock into the Mangaatua Stream. The unnamed stream is characterised by a deep channel with exotic grass growing along the stream banks. The discharge enters the drain at the southern boundary of Lot 1 DP 22349, prior to the drain flowing across approximately 240 metres of farmland before entering the Mangaatua Stream. Access to the Woodville STP site is from Station Street over the Woodville–Palmerston North Railway line and via a Right of Way easement over farmland within Lot 2 DP 26735 and Lot 6 DP 28374. The effluent screening facility, shed and associated

[121] Tararua District Council, "Woodville Sewage Treatment Plant Resource Consent Application", September 2010, p. 4.

pump equipment is situated within Lot 6 DP 28374, which is owned by a neighbouring landowner (Auroam Rima Ltd).

## A1.3 The Pahiatua Sewage Treatment Plant Site

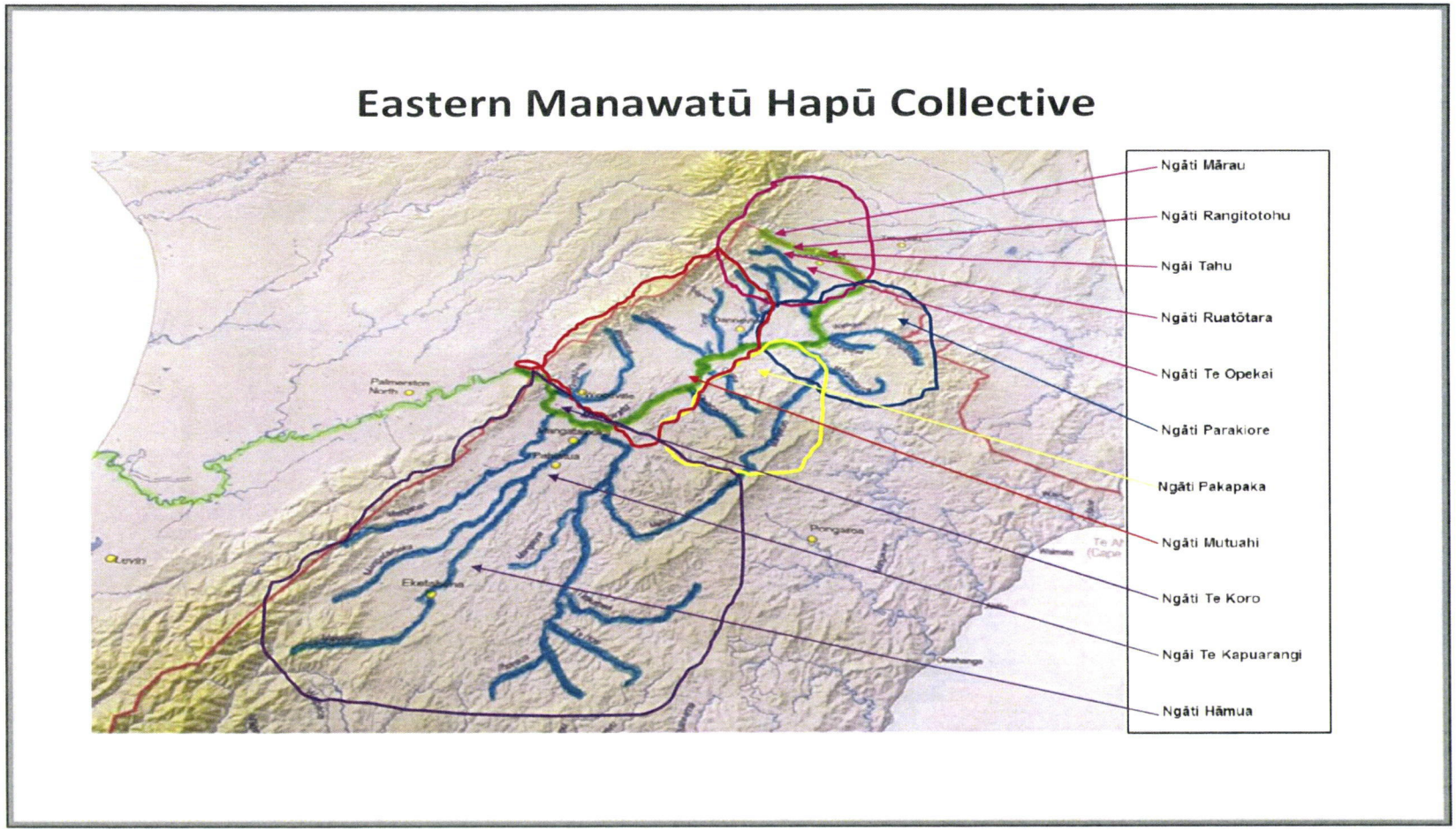
The Pahiatua Sewage Treatment Plant is situated on the north western edge of Pahiatua Township within rural land north of Hamilton and Cambridge Streets, with entry to the access lane from Julia Street. The site is legally described as Part Lot 2 DP 52391 (CT WN 44B/617)). The system is fed by a gravity system from the township through an influent meter into the plant via a screening system (due to be replaced at the time of the interview with the ex-Woodville screen) into the first of three ponds. Discharge is via a small creek into the Mangatainoka River. At the time of the site inspection for this report, development of the site was underway to provide further treatment of the effluent to eliminate phosphorus (through the use of an organic coagulant derived from acacia bark) and ultraviolet treatment to eliminate harmful bacteria.

# Appendix 2 Maps

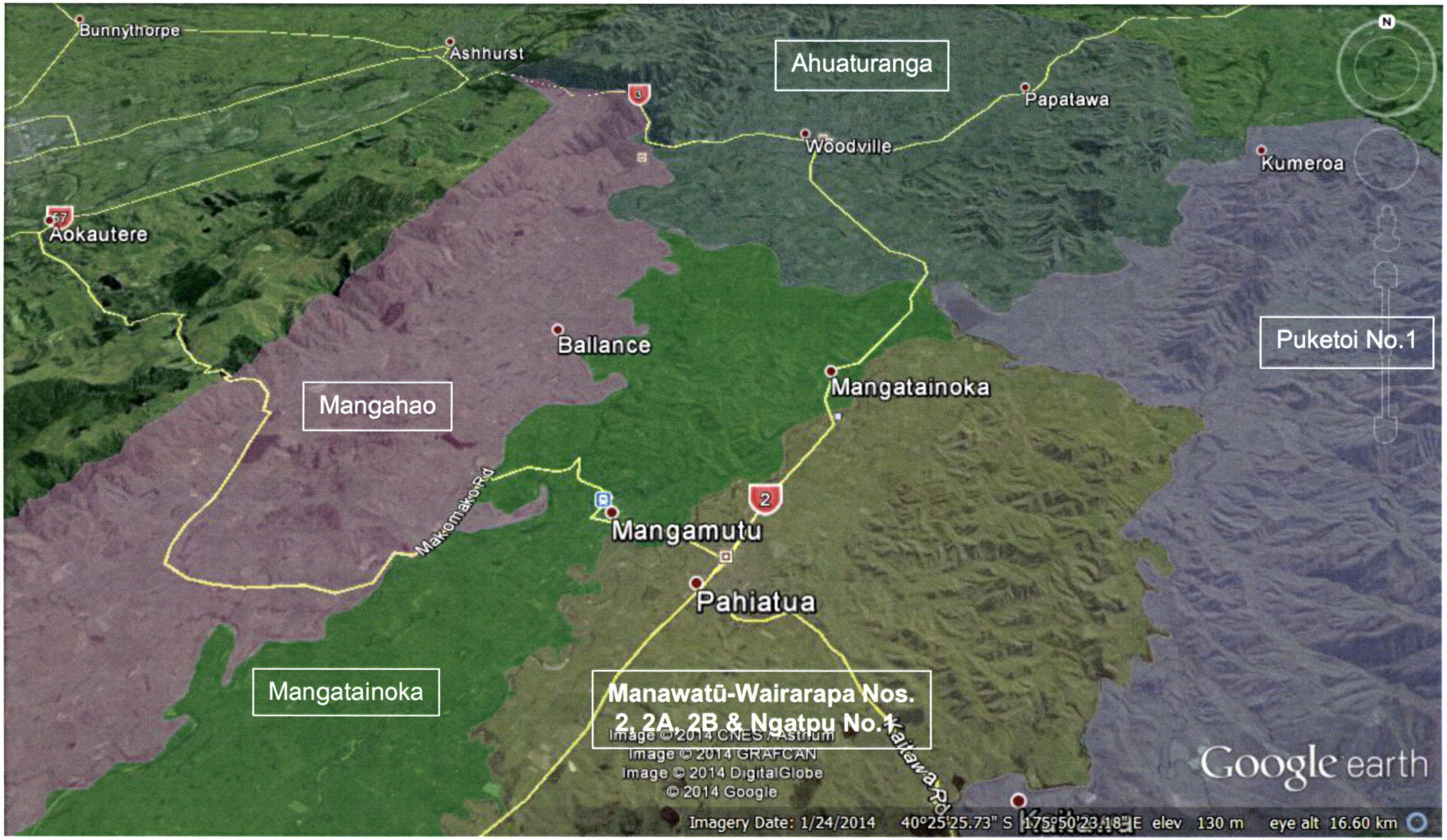
## B1.1 Boundary Map


Geographic description of Tamaki-nui-a-Rua
aka Seventy-Mile Bush, Tamaki Bush, Forty-Mile Bush

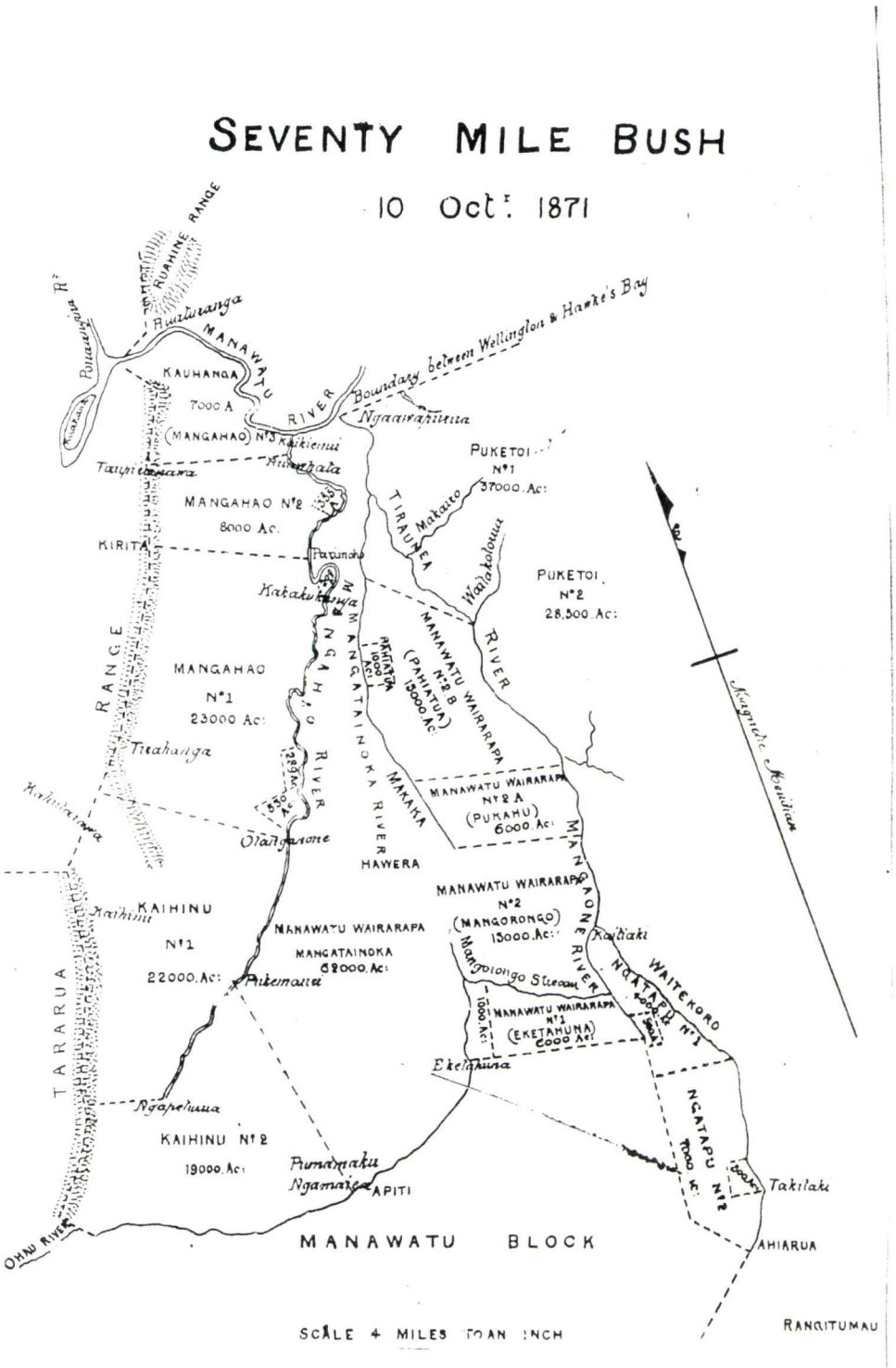
## B1.2 Te Kāuru Hapū Map



## B1.3 Block Map



## B1.4 Seventy Mile Bush Land Purchases Map



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|---|---|
| TO | Dave Watson |
| COPY | Tabitha Manderson |
| FROM | Paul King |
| DATE | 11 March 2014 |
| FILE | 3-38650.00 |
| SUBJECT | Additional Commentary: *Pahiatua Wastewater Land Irrigation - Preliminary Investigation Report* |

## 1.1 Background

Currently the Paihiatua WWTP discharges directly to Town Creek which runs adjacent to the existing oxidation ponds. This creek is a tributary to Mangatainoka River and the Regional Council is looking to improve the river water quality by reducing or preventing the direct discharge of treated effluent especially during low flow conditions (flows < 1,260l/s).

Opus have been engaged by the Tararua District Council (TDC) to renew the existing resource consent for the discharge of treated wastewater from the treatment plant to water where it ultimately enters the Mangatainoka River. TDC have been asked by Regional Council to review the option of land irrigation as a potential alternative to the current discharge to water (Town Creek) for either the total flows or during low flow conditions in the river.

## 1.2 Purpose

The purpose of this memo is to provide additional comment (where appropriate) to augment the investigation into the disposal of treated wastewater effluent to land from the Pahiatua Wastewater Treatment Plant (WWTP).

We have structured this memo to comment on the specific areas of the *Pahiatua Wastewater Land Irrigation - Preliminary Investigation Report* (hereafter referred to as The Report) to provide either additional comment or highlight additional risks that should be considered.

This memo uses the data in The Report and makes some basic calculations to illustrate the magnitude of storage required. These high level basic calculations are divided into:

- Cumulative total surplus volumes at irrigation rates of 1,400m$^3$/day and 1,840m$^3$/day (table 1).
- Cumulative surplus volumes at irrigation rates of 1,400m$^3$/day where the balance cannot be discharged to water because of low flow days in the river (table 2).
- Cumulative surplus volumes at irrigation rates of 1,840m$^3$/day where the balance cannot be discharged to water because of low flow days in the river (table 3).

## 1.3 Wastewater Evaluation

The wastewater evaluation has outlined highly variable averaged daily flows (based on a monthly average) from the WWTP these ranging from 838 – 3,778m$^3$/day[1]. The sizing of the disposal field in The Report for the land irrigation requirements has been based on a daily irrigation volume 1,400m$^3$/day.

The sizing of the land disposal requirements in this manner results in a surplus of treated effluent during months when the average daily flows exceed the proposed irrigation rate. This additional volume will need to be either retained (storage) or disposed of via a separate system (i.e. the discharge to water). This will be necessary until the average daily flows drop below 1,400m$^3$/day to allow the stored surplus to be discharged. Please note this evaluation excludes any allowance for season changes to soil moisture deficit taken over the summer/autumn period.

Based on the average daily flows, taken from *table 1* of The Report, a cumulative volume for a buffer pond or disposal (via a parallel discharge direct to water) required for the 3 month period (January – March 2012) is 96,000m$^3$ using an irrigation volume of 1,400m$^3$ day. This cumulative volume is reduced to 64,000m$^3$ (January – February 2012) and balanced over the total 5 month period by increasing the irrigation volume to approximately 1,840m$^3$ day.

**Table 1: Calculation of surplus treated effluent based on 2012 flows using two potential irrigation rates**

| Month (2012) | Monthly Total Discharge (m$^3$) Treated Effluent | Averaged Daily Flow (m$^3$/day) Treated Effluent | Balance of Volume (m$^3$) @1,400 m$^3$/day irrigation rate | Balance of Volume (m$^3$) @1,840 m$^3$/day irrigation rate |
|---|---|---|---|---|
| **January** | 117,118[2] | 3,778 | **73,718** | **60,121** |
| **February** | 54,724 | 1,887 | **15,524** | **3,243** |
| **March** | 49,759 | 1,605 | **6,359** | -7,238 |
| **April** | 25,130 | 838 | -16,870 | -30,028 |
| **May** | 30,900 | 997 | -12,500 | -26,097 |
| **AVERAGES/ CUMULATIVE MAXIMUM** | **55,526** | **1,821** | **95,601** | 63,**364** |

### 1.3.1 Buffer Pond Storage

This pond will have the potential for algal growth which will need to be addressed during its design. The buffer pond storage will also be required to account for:

- Rainfall over the buffer pond catchment.
- Emergency storage due to failure of the irrigation network components (i.e. pump failure).

[1] Taken from table 1 of The Report and based on a monitoring period of 5 months from January – May 2012.

[2] These figures are taken directly from the report. No validity of the large variation in Average Daily Flows check has been undertaken (i.e. why January flows are approximately 5 times that of April.

- Non-irrigation days (i.e. heavy rainfall days or after prolonged wet weather where irrigation to land will not be possible).
- Solids settlement/accumulation in the ponds (reduction in total storage volume).

In addition to those considerations above the following geotechnical elements would need to be considered where designing the pond:

- The prevention of discharge into the underlying soils. The pond will likely be required to be lined using a low/impermeable liner in a manner that allows for the periodic maintenance (i.e. removal of sludge) required.
- The depth to groundwater. The pond will need to be constructed above the water table to prevent delamination of the pond lining when the pond water level is reduced.

As the WWTP is located in the *Tararua Groundwater Management Zone* and most groundwater in that area is linked to surface water[3] (Town Creek) and given the flat topography groundwater will be close to ground level. The potential depth of the buffer pond may be limited. Assuming a maximum depth of 3 - 4 metres, it will require a footprint of something between 3 - 4 hectares (ha) based on the additional storage requirements estimated at between 20 – 35%.

### 1.3.2 Discharge to Water

The discharge of the surplus treated effluent to Town Creek relies on the availability of the Mangatainoka River. The discharge of treated effluent to water should be restricted during trigger flow conditions (flow below 1,570l/s)[4] and prevented during low flow conditions (1,260l/s)[5]. During these periods of low flow, storage of the surplus treated effluent will be required. The data for these days is taken from *table 2* of The Report.

Over the period January – March (2012) there is a net surplus of treated effluent (table 1 above). The maximum number of low flow days occurring in this same period was recorded at 41 (2008) and if this is considered with the initial trigger value the number of days increase to 54 (2008).

**Table 2: Surplus effluent volumes based on low flow/trigger value days with 1,400m³/day irrigation**

| YEAR | 2008 | | 2009 | | 2010 | | 2011 | | 2012 | | 2013 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *MONTH* | Low flow surplus | Trigger flow surplus | Low flow surplus | Trigger flow surplus | Low flow surplus | Trigger flow surplus | Low flow surplus | Trigger flow surplus | Low flow surplus | Trigger flow surplus | Low flow surplus | Trigger flow surplus |
| *January* | 11,890 | 11,890 | 4,756 | 9,512 | - | - | - | 19,024 | - | - | - | - |
| *February* | 9,740 | 487 | 5,357 | - | - | - | - | 4,383 | - | - | 4,383 | 2,922 |
| *March* | 3,280 | 1,435 | 205 | - | - | - | - | - | - | - | 4,510 | 410 |
| ***Total*** | **24,910** | **13,812** | **10,318** | **9,512** | | | | **23,407** | | | **8,893** | **3,332** |

[3] Taken from *The Report on Horizons Groundwater Level Monitoring Network and Groundwater Quantity Management Issues* – prepared by PDP dated May 2013
is closely linked to surface waterways –
[4] initial trigger for potable water restrictions
[5] full potable water restrictions

**Table 3: Surplus effluent volumes based on low flow/trigger value days with 1,840m³/day irrigation**

| YEAR | 2008 | | 2009 | | 2010 | | 2011 | | 2012 | | 2013 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *MONTH* | Low flow surplus | Trigger flow surplus | Low flow surplus | Trigger flow surplus | Low flow surplus | Trigger flow surplus | Low flow surplus | Trigger flow surplus | Low flow surplus | Trigger flow surplus | Low flow surplus | Trigger flow surplus |
| *January* | 9,697 | 9,697 | 3,879 | 7,758 | - | - | - | 15,515 | - | - | - | - |
| *February* | 968 | 48 | 532 | - | - | - | - | 435 | - | - | 435 | 290 |
| ***Total*** | **10,665** | **9,745** | **4,411** | | | | | **15,950** | | | **435** | **290** |

At an irrigation rate of 1,400m³/day and allowing for total retention of the surplus effluent during low flow days in the Mangatainoka River (January - March 2008) when parallel discharge is not possible. The total surplus treated effluent volume totals 25,000m³. This reduces to 11,000m³ (again using figures for low flow from January - February 2008) if the irrigation rate is increased to 1,840m³/day (table 3). Please note that these pond volumes will still be subject to the additional volume considerations outlined above in section 1.3.1.

### 1.3.3 Summary

Land irrigation of treated effluent would still require provision for the storage based on these two scenarios:

a. Sole discharge of effluent via land irrigation without any parallel discharge to water (*this is outlined above in section 1.3*) at minimum[6] would require 96,000m³ of storage. This storage would need to cater for high load months (January – March), non-irrigation days and emergency storage; and

b. The parallel discharge to water using Town Creek. This storage would still be required to cater for low flow conditions in the Mangatainoka River and at minimum[5] would be 25,000m³ (January – March). *This is outlined above in section 1.3.2.*

The storage requirements are reduced when increasing the irrigation rates to 1,840m³/day but are still required to cater for the surplus volumes of the January and February Average Daily Flows (totalling 64,000m³ and 11,000m³ respectively)[7]. Any parallel discharge to water during January and February are also likely to coincide with low flow conditions in the Mangatainoka River and that is why storage is still required in this scenario.

## 1.4 Land Area

### 1.4.1 Irrigation Area

The Report outlines the land area requirements for irrigation (approximately 28ha) based on a conservative application rate of 5mm per day. Should the irrigation volumes be increased to 1,840m³/day the land area at this application rate increases to 37ha. Note this is only the nett irrigation area required on a daily basis, based on application rate, and will be still be subject to:

[6] Based on an irrigation rate of 1,400m³/day
[7] Based on 11,000m³ to cater for the January, February 2008 low flow days see table 3

- Crop rotation and establishment
- Non-irrigation days (rest days or periods of heavy rainfall)
- Access tracks for machinery
- Stand down periods prior to grazing or harvest (in the order of 7 – 14 days)
- Buffer zones from neighbouring properties as outlined in The Report

It is noted that an application rate of approximately 15mm per day (based on the nitrogen loading rate of 150kg/ha) was suggested in The Report to reduce the required irrigation area to 9.5ha. However with no detailed site investigations undertaken we would recommend any calculations are presently based on an application rate of no more than 35mm per week.

On the basis of an assumed seven day rotation using three irrigation sites (i.e. one week irrigation with two weeks stand down to allow for harvest or grazing) the total irrigable area required would be 74 – 111ha (excluding allowances for buffer zones or access areas outlined above). This is larger than the sites identified in The Report although could be reduced to 29– 38 ha if the application rate was able to be increased to 15mm/day.

### 1.4.2 Soils analysis & Groundwater

The soils analysis has found that the underlying soils (Esk Sand or Manawatu Sandy Loam) overlain by sandy topsoil make the strata favourable for the treatment of effluent. However site investigations would be necessary to determine:

- The infiltration rate for the overlying topsoil. This will determine application rate to prevent surface ponding.
- The depth to groundwater. (A minimum separation depth of between 600mm – 1000mm from discharge to ground water level is required for disinfected water)[8]
- The transmissivity of the underlying soils to determine the extent of lateral spread and potential effects on nearby abstractions.

It is likely that groundwater will be located near the ground surface as the surrounding land is predominantly flat and in close proximity to the Mangatainoka River. Therefore the potential effect on any neighbouring abstractions would need rigorous consideration prior to the use of any local area for irrigation.

## 1.5 Irrigation Methods

The use of spray irrigation methods such as travelling irrigator or pod irrigation outlined in The Report would have the potential risks of:

- Spray Drift (during high winds)
- Odour nuisance

These risks have been outlined in The Report and could be addressed using buffer zones and the use of shelter belts at the irrigation boundaries. These however reduce the effective irrigation areas on any potential site under consideration. It is noted in The Report that the

[8] Taken from table 2.2 of the Horizons Regional Council Manual for On-site Wastewater Systems Design and Management

preferred irrigation (Potential Site Two) site was reduced by 44% when these were allowed for.

## 1.6 Potential Irrigation Sites

The potential irrigation site (Potential Site Two) identified in The Report would be the only suitable site for a land disposal option if the application rate was around 15mm per day. A significant amount of further work would be required to confirm the suitability of this high application rate. If the application rate could not be established at this high rate then the land area requirements would increase considerably along with the costs of potential irrigation infrastructure.

## 1.7 Conclusion & Recommendation

In summary we would suggest that the discharge to land is not a cost effective option for this site as this relies on a relatively high application rate and this would still require significant temporary storage when any non-irrigation conditions occur (i.e. heavy rainfall occurs).

We would recommend the best option was to maintain the existing method of discharge (to water), if any affects could be adequately mitigated, but provide for additional storage to cater for periods of potential low flow in the Mangatainoka River. This storage could be sized based on an agreed set of parameters with the Regional Council (i.e. based on a regression analysis of low flow events combined with the coincident effluent discharge amounts at low flow in the Mangatainoka River).

# PAHIATUA WASTEWATER

# LAND IRRIGATION

# PRELIMINARY INVESTIGATION

# TARARUA DISTRICT COUNCIL

wai waste
environmental consultants ltd
Consulting Engineers

**July 2013**

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25 July 2013

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| Quality Record | Name | Date | Signature |
|---|---|---|---|
| Prepared By: | D Veale | July 2013 | |
| Authorised By: | D Watson | August 2013 | |

# CONTENTS

## 1.0 Executive Summary

Wai Waste Environmental Consultants Ltd has been engaged to undertake a preliminary investigation in to the potential for land irrigation of effluent from the Pahiatua wastewater ponds during summer low flow conditions in the Mangatainoka River.

Currently, the wastewater is discharged to the Town Creek which flows in to the Mangatainoka River under all flow conditions. To improve water quality, particularly during low flow conditions, the option of irrigating all wastewater to land is being explored.

The wastewater discharge flows are highly variable from the Pahiatua oxidation ponds. During the summer months when low flows are typically experienced in the Mangatainoka River (January to April) the average daily discharge from the ponds is 1,400$m^3$. On a total nitrogen basis the volume of effluent produced over a 120 day irrigation period would require a minimum of 9.5ha of land.

On a conservative hydraulic loading basis the minimum land area required would increase to 28ha. A review of the land surrounding the Pahiatua oxidation ponds identified several site constraints in terms of possible irrigation sites, primarily due to the topography, proximity of small property titles and the proximity of the Mangatainoka River.

Three sites were identified as potentially suitable for effluent irrigation in close proximity to the oxidation ponds. A preferred site has been identified however the site has risk around potentially the resource consent process may be onerous around odour management and the potential for odour drift in to the outskirts of Pahiatua Township, although this is considered manageable.

With a potential optimum site identified it is recommended that a more detailed analysis be undertaken, including TEC modelling and detailed site investigations. This will enable an in-depth cost benefit analysis to be completed to assist with site and/or treatment improvement options to be finalised. It is considered likely that a combination of land irrigation and surface water discharge would be feasible, which the TEC modelling would identify.

A rough order of costs has been completed to provide an estimate to establish an irrigation network at site one which was $535,000 excluding land purchase which would add a potential further $1,925,000.

Some risks have been identified that will require mitigation including long term landownership, potential legal easements, confirmation of soil conditions, and a potentially onerous resource consent process.

## 2.0 Scope of Work

Wai Waste Environmental Consultants Ltd has been engaged to undertake a preliminary investigation in to the potential for land irrigation of wastewater discharge from the Pahiatua wastewater ponds during low flow conditions in the Mangatainoka River.

Currently, the wastewater is discharged to the Mangatainoka River under all flow conditions. To improve water quality, particularly during low flow conditions, the option of irrigating all wastewater to land is being explored.

This preliminary investigation in to land irrigation during low flow conditions quantifies potential wastewater volumes, nutrient concentrations and identifies potential sites with favourable soils in close proximity to the existing wastewater ponds that would be suitable for land irrigation of this scale. The report also provides rough order of costs to establish land irrigation for this project.

## 3.0 Introduction

To restore the health of the Manawatu River the Ministry for the Environment established the 'Fresh Start for Freshwater Clean-up Fund' project which investigates and funds projects that will benefit and improve water quality. Several municipal wastewater to surface water discharges have been the focus of investigations to identify opportunities for potential environmental improvements, with Pahiatua township discharge being one.

Pahiatua is a reasonable size town located within the Tararua District with a population of approximately 2,600 persons. The town is located within an alluvial valley and is bounded to the west by the Mangatainoka River which is recognised as a high value river and is protected by a National Water Conservation Order. Several surface drains surround the township to the east also. Figure 1 demonstrates the locality and topography of the surrounding area.

The current wastewater treatment operation is relatively basic comprising 3 oxidation ponds with effluent discharged in to Town Creek which flows in to the Mangatainoka River. Council is in the process of evaluating upgrade options to the current treatment operation, including a stepped screen, installation of baffles in to the ponds, rock filters and Ultra Violet disinfection unit. The oxidation ponds have a total estimated operational volume of 90,000$m^3$. Figure 2 demonstrates an aerial map of the oxidation pond layout.

The above mentioned discharge operates under discharge permit MWC4369. A consent renewal process has commenced (consent 103246), however the application is likely to be modified once the final optimisation design has been confirmed.

There is no significant industry discharging in to the municipal wastewater network.

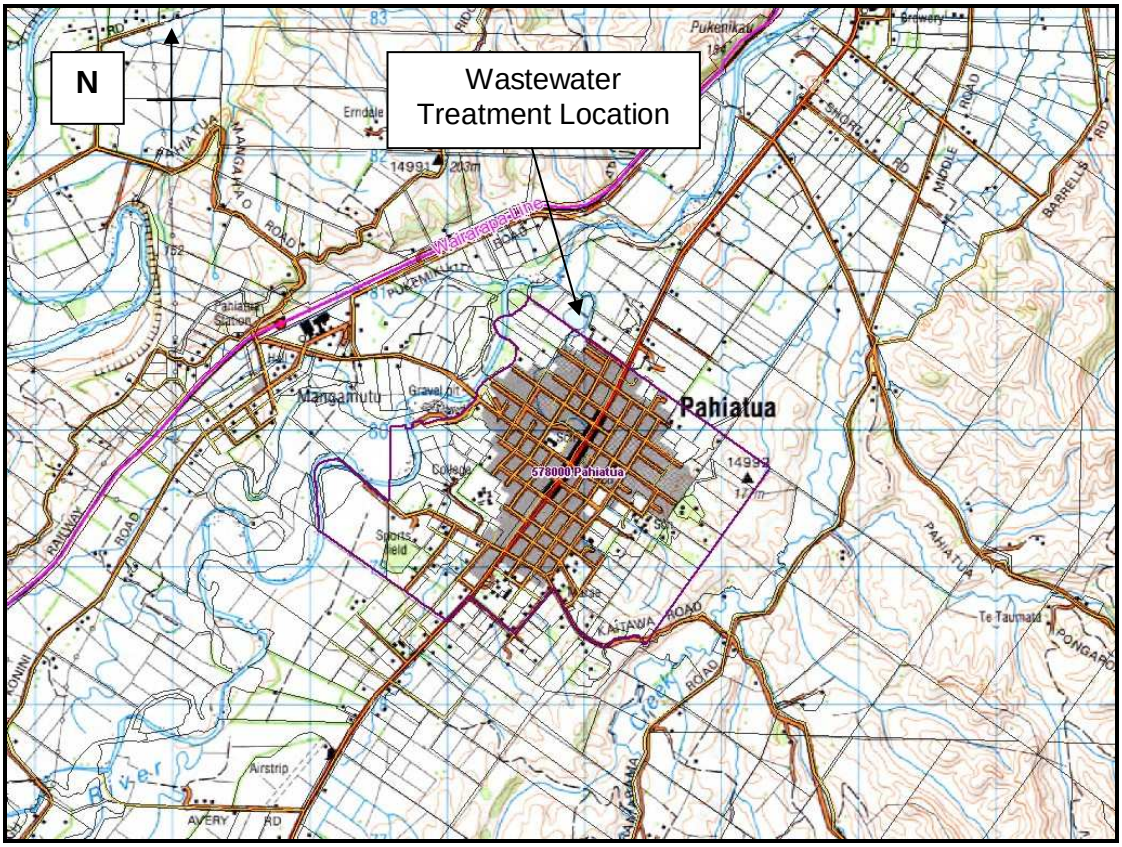



Figure 1. Pahiatua Locality Plan.

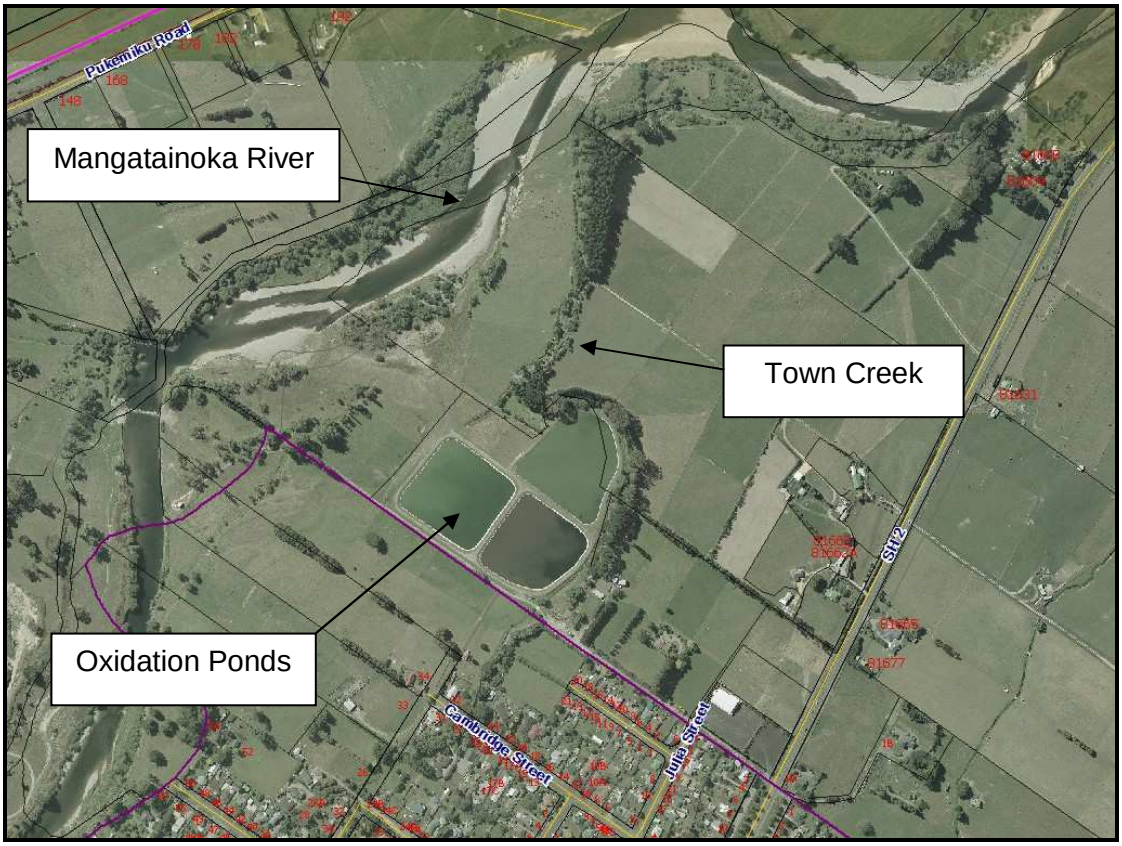



Figure 2. Pahiatua Oxidation Ponds.

## 4.0 Wastewater Evaluation

The discharge flow records from the outlet of the tertiary oxidation pond from September 2011 to October 2012 have been used to provide an initial basis for determining potential flow volumes for land application during low flow conditions within the Mangatainoka River. A wider historical analysis has not been undertaken due to a lack of confidence in recording data and historical stormwater infiltration issues.

For the purposes of this preliminary investigation, the threshold for low flow conditions in the Mangatainoka River has been taken as 1,260 litres per second which is the recognised low flow trigger value for the Pahiatua potable water abstraction. An initial trigger value of 1,570 litres per second is also utilised when restrictions to the volume of potable water take commence.

A review of the flow discharge data from the oxidation ponds from September 2011 through to October 2012 provides the following data summary for the months of low river flows typically being January through to May.

| Month | Monthly Total Discharge ($m^3$) | Average Daily Flow ($m^3/d$) |
|---|---|---|
| January | 117,118 | 3,778 |
| February | 54,724 | 1,887 |
| March | 49,759 | 1,605 |
| April | 25,130 | 838 |
| May | 30,900 | 997 |

Table 1. Discharge totals from 2012, low flow months.

The land irrigation analysis has been based on an average daily flow or 1,400$m^3$ which is considered to be a reasonable volume for the purposes of identifying potential land irrigation requirements for the period of low flow conditions in the Mangatainoka River. Tararua District Council is in the process of identifying and reducing stormwater infiltration areas within urban communities which have a significant impact on storm flow events through the wastewater network.

A review of flow conditions within the Mangatainoka River since 2008 has been undertaken to identify the duration when low flow conditions are experienced to quantify potential irrigation duration. The period from January 2008 to April 2008 had the longest duration of when low flow conditions were experienced. During this period there were 45 days when flows were recorded below 1,260l/s, and a further 13 days with flows between 1,570l/s and 1,260l/s. Comparably for the same period in 2013 with the region under drought conditions 41 days were recorded with flow levels less than 1,260l/s and 11 days with flows between 1,570l/s and 1,260l/s. The above mentioned numbers are when flows were intermittently below the thresholds not for continuous days when flow was below thresholds. A summary of low flow data is included as Table 2 for reference.

| | 2008 | | 2009 | | 2010 | | 2011 | | 2012 | | 2013 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | < 1260 l/s | <1570 > 1260 l/s | < 1260 l/s | <1570 > 1260 l/s | < 1260 l/s | <1570 > 1260 l/s | < 1260 l/s | <1570 > 1260 l/s | < 1260 l/s | <1570 > 1260 l/s | < 1260 l/s | <1570 > 1260 l/s |
| January | 5 | 5 | 2 | 4 | - | - | - | 8 | - | - | - | - |
| February | 20 | 1 | 11 | - | - | - | - | 9 | - | - | 9 | 6 |
| March | 16 | 7 | 1 | - | - | - | - | - | - | - | 22 | 2 |
| April | 4 | - | 1 | 3 | - | 3 | - | - | - | - | 10 | 3 |
| November | - | - | - | - | - | 2 | - | - | - | - | - | - |
| December | - | - | - | - | - | 6 | - | - | - | - | - | - |
| **Total** | **45** | **13** | **15** | **7** | **-** | **11** | **-** | **17** | **-** | **-** | **41** | **11** |

**Table 2. Summary of Mangatainoka River low flow results demonstrating number of days below threshold levels.**

For the purposes of evaluating potential land irrigation sites and land area requirements, an irrigation duration of 120 days has been utilised which is considered sufficient to cover extended periods when low flows are experienced.

Using an average daily flow of 1,400m$^3$ over a four month irrigation period provides an estimated 168,000m$^3$ of effluent for irrigation.

A full evaluation utilising the Town Effluent Calculator (TEC) has not been undertaken due to proposed operational improvements which is likely to have an impact on effluent quality and quantity. Should land irrigation be considered feasible, it is recommended a detailed analysis be completed utilising the TEC to finalise and/or optimise land irrigation design. It is considered likely that a combination of land irrigation and surface water discharge could be feasible, which the TEC modelling would identify.

## 5.0 Land Area Requirements

The topography of the land surrounding the oxidation pond site is described as stepped alluvial terraces which are relatively flat with numerous low graded surface drains and streams draining the soils.

Mr Dave Horne of Massey University has provided soil maps of the area which identifies the soils surrounding the oxidation pond as either Esk Sand or Manawatu Sandy Loam or Silt Loam. Mr Horne has classified these soils as being good for land treatment of effluent. The soil classification would be confirmed through the detailed site investigations should land irrigation be adopted. The soil maps are included as Appendix A for reference.

Test results indicate the average total nitrogen concentration within the wastewater effluent is 8.2g/m$^3$. With a likely typical limitation of 150kgN/ha/year, on a nitrogen basis, a minimum of 9.5 hectares of land would be required for effluent irrigation. A summary of wastewater effluent test results is included as Appendix B.

If the total effluent volume was applied over 9.5 ha this would equate to a depth of 1,770mm over a 4 month irrigation period (14.75mm/day), which is considered high for the soil types surrounding the oxidation pond site. This would not only result in irrigation during potential non-soil moisture deficit times but also increase the risk of ponding and/or runoff in to surface drains or leaching through soils. As a minimum the irrigation depth should be matched to soil conditions and crop uptake rates, and should be the subject of detailed analysis.

Based on a more conservative hydraulic loading rate of an average of 5mm per day the irrigation area required would increase to 28 hectares. A more detailed analysis of soil types and soil moisture deficits may demonstrate that a higher hydraulic loading rate can be applied sustainably without risk of ponding and/or runoff, and hence reduce the overall irrigation area required.

## 6.0 Irrigation Methods

Two types of irrigation methods have been considered including fully automated travelling irrigators (linear and centre pivot) and irrigation pods. The fully automated travelling irrigators would be preferred incorporating programming to allow for irrigators to adhere to exclusion zones including passing over surface drains and/or

around boundary or residential exclusion zones. The technology and equipment components are reflected in the high capital costs, however operational costs would be considered lower compared to pod irrigation. Appropriate screens will be required to be maintained to mitigate nozzle blockages.

Pod irrigation is well suited to areas that are odd shapes that centre pivot or linear irrigators cannot access. The pod irrigation capital costs are considerably lower than for travelling irrigators, however operational costs with continual shifting would be considerably higher and difficult if crops are to be grown.

A further alternative is to have telescopic irrigation nozzles, however the capital cost would be high and limitations around ground cultivation would be required.

## 7.0 Potential Irrigation Sites

A review of aerial photographs overlain with property titles identifies limited potential irrigation sites in close proximity to the oxidation ponds. The surrounding area has several constraints in terms of available irrigation areas including small property holdings, numerous surface drains, the Mangatainoka River, dairying land and residential dwellings.

Applying appropriate separation distances of 150m from dwellings, 50m from property boundaries, and 20m from water ways and bores further restricts effective irrigation areas. Considering the above, three sites have been identified as possible irrigation sites.

The sites have been identified via desktop study only with no field investigations and/or landowner consultation. Should land irrigation be considered practical and appropriate field investigations and landowner consultation would need to be undertaken to confirm site availability and site specific constraints.

### 7.1 Potential Site One

Potential site one is located adjacent to the oxidation ponds to the north-east. The site is currently utilised as a lifestyle block which could be enhanced by effluent irrigation. The landowner has expressed an interest in effluent irrigation.

The titled area of this block is 27.1ha and has Town Creek passing through the middle and the Mangatainoka River to the rear of the property. Accounting for separation distances the effective area is reduced to 5.8ha which is not sufficient to accommodate all effluent under a 100% irrigation scenario, and as such either another land area is required and/or a reduced volume of effluent is irrigated through a combined model of discharge to water and irrigation.

The predominant wind direction of north-west may cause issues for odour drift with several residential dwellings immediately east of the site. The titled area would suit a combination of linear travelling irrigator and pod network. Site one is comparable in elevation to the oxidation ponds and is demonstrated in Figure 3.

Figure 3. Potential Site One for Effluent Irrigation.

### 7.2 Potential Site Two

Potential site two is located approximately 500m east of the oxidation ponds located adjacent to State Highway 2. The site is currently utilised as a sheep and beef unit growing crops occasionally which could be enhanced by effluent irrigation.

The titled area of this block is 77.4ha and has a number of surface drains passing through the middle. Accounting for relevant separation distances the effective area is reduced to 43ha.

The predominant wind direction of north-west is unlikely to cause issues for odour drift with minimal residential dwellings immediately east of the site. The titled area would suit a combination of linear travelling irrigator and pod network.

Site two is higher in elevation than the oxidation ponds by approximately 3.5m. Site two is demonstrated in Figure 4.

Figure 4. Potential Site Two for Effluent Irrigation.

### 7.3 Potential Site Three

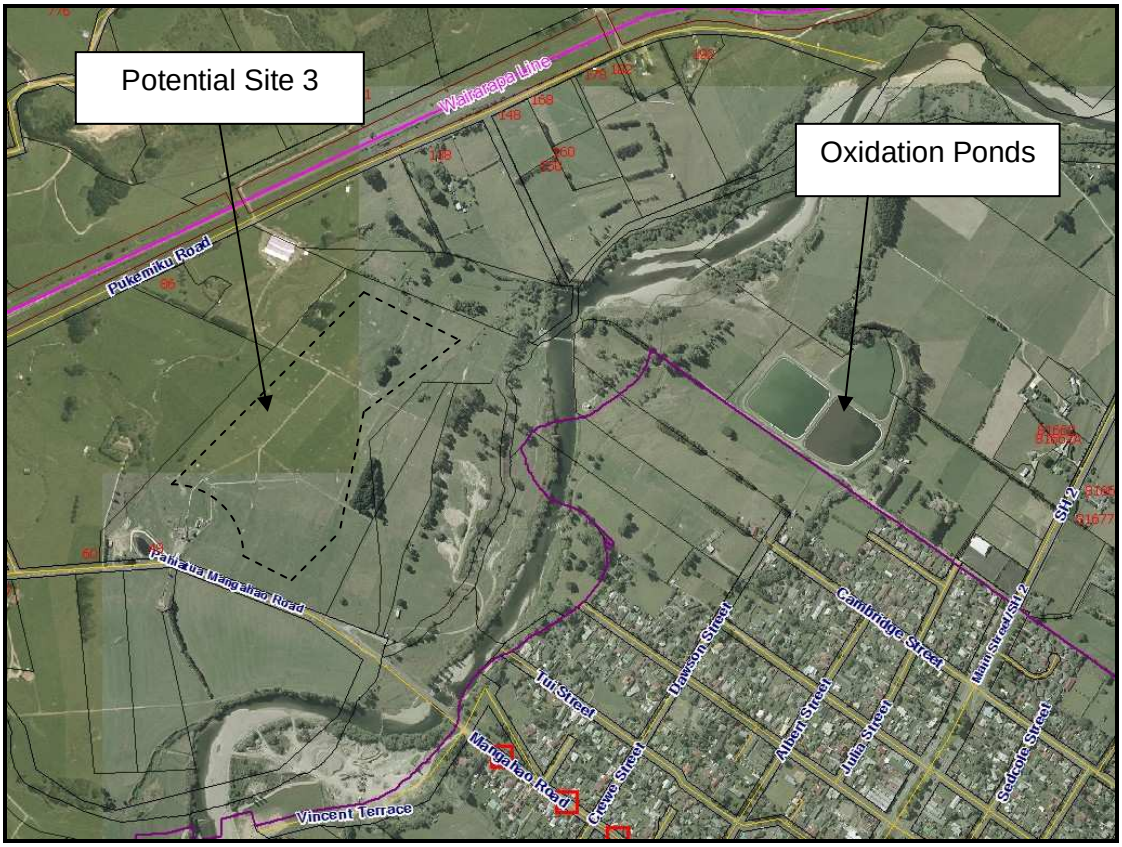
Potential site three is located approximately 800m south-west of the oxidation ponds located adjacent to Mangahao Road.

The site is currently utilised as a calf rearing unit and as such may be unsuitable for use for effluent irrigation. Municipal effluent application is restricted on dairy farms due to milk with holding periods which may extend to calf rearing operations.

The titled area of this block is 23.6ha and has minimal surface drains through the property. The effective area is estimated to be 10.3 ha with all separation distances taken in to account. This site is in a rural environment with minimal residential dwellings in close proximity.

The predominant wind direction of north-west would have the potential for odour drift on to the outskirts of Pahiatua Township which could lead to consenting issues.

The site is comparable in elevation to the oxidation ponds. The titled area would suit a linear travelling irrigator. Site three is demonstrated in Figure 5.




### 7.4 Optimal Site

Potential Site 2 is considered the optimal site due to the size of the property and the location with respect to predominant wind direction which is likely to be a factor in any resource consent application.

The soil conditions are considered favourable for effluent irrigation, and although several surface drains are present a linear travelling irrigator could be programmed to account for separation distances.

Furthermore, this property is currently for sale, which if purchased would potentially provide a long term, sustainable land irrigation option for Council.

## 8.0 Statutory Considerations

In order to progress any potential land irrigation of municipal wastewater further detailed investigations are required including detailed design and confirmation of site conditions.

In order to identify and establish potential land application areas typical statutory considerations that would likely be included as resource consent conditions have been considered. Environmental, social and cultural considerations will require further evaluation should the potential for land irrigation of municipal effluent be considered feasible.

## 9.0 Feasibility

It is difficult to compile a detailed feasibility analysis for land irrigation of the municipal wastewater from the Pahiatua oxidation ponds due to a number of uncertainties. However, assuming site two is the preferred site (subject to confirmation of soil and site conditions and landowner consultation) this would likely be the most cost effective due to the proximity to the oxidation ponds. A rough order of costs has been compiled to provide an indication of potential capital costs, and has been summarised in Table 3.

| Item | Description | Cost Estimate |
|---|---|---|
| 1. | Detailed Investigation & Design | $20,000 |
| 2. | Resource Consent (Notified) | $25,000 |
| 3. | Legal Documentation | $15,000 |
| 4. | Pipe Network Including Pumps (State Highway Crossing) | $185,000 |
| 5. | Travelling Irrigators & Control Equipment (power supply) | $220,000 |
| | **Sub Total** | **$465,000** |
| 6. | Contingency – 15% | $70,000 |
| | **Total RoC** | **$535,000** |

Table 3. Rough Order of Costs Estimate.

Based on a desktop study a Rough Order of Costs estimate to establish an effluent irrigation system at Site One is $535,000. This does not include landownership and relies on the landowner agreeing to utilise the effluent. Should landownership be required potentially for the 77 ha title may add another $1,925,000 to the above estimate. A full cost benefit analysis would be required to further quantify the economics of this project.

## 10.0 Risk Assessment

The risks associated with applying municipal wastewater from the Pahiatua oxidation ponds include limited control over landownership (unless land is purchased), and a resource consenting process which may impose tight consent conditions.

To mitigate the landownership risk land would either need to be purchased outright or a long term lease arrangement entered in to. It may be difficult to find a landowner willing to form a partnership to allow effluent irrigation. The purchase of the property that is for sale would provide long term security of the site for irrigation.

The resource consent process could be onerous due to irrigation site constraints and proximity to Pahiatua Township.

Legal easements are likely to be required which some landowners may be reluctant to agree to and/or oppose.

## 11.0 Conclusions and Recommendations

The wastewater discharge flows are highly variable from the Pahiatua oxidation ponds. During the summer months when low flows are typically experienced in the Mangatainoka River (January to April) the average daily discharge from the ponds is

1,400m$^3$. On a total nitrogen basis the volume of effluent produced over a 120 day irrigation period would require a minimum of 9.5ha of land.

On a conservative hydraulic loading basis the minimum land area required would increase to 28ha. A review of the land surrounding the Pahiatua oxidation ponds identified several site constraints in terms of possible irrigation sites, primarily due to the topography, proximity of small property titles and the proximity of the Mangatainoka River.

A preferred site has been identified however the site has risk around potentially the resource consent process may be onerous around odour management and the potential for odour drift in to the outskirts of Pahiatua Township, although this is considered manageable.

With a potential optimum site identified it is recommended that a more detailed analysis be undertaken, including TEC modelling and detailed site investigations. This will enable an in-depth cost benefit analysis to be completed to assist with site and/or treatment improvement options to be finalised. It is considered likely that a combination of land irrigation and surface water discharge would be feasible, which the TEC modelling would identify.

## 12.0 Applicability and Limitations

This report has been prepared solely for the use of Tararua District Council for the purpose of investigating and identifying potential land irrigation sites in close proximity to the Pahiatua Oxidation Ponds for the purposes of irrigating effluent during low flow conditions in the Mangatainoka River. The report has been prepared for the purpose of providing an initial assessment of the potential sites available for effluent irrigation.

This report has been in the form of a desktop study and has utilised publicly available information, information provided by others including Tararua District Council, Horizons Regional Council, and Massey University. Wai Waste Environmental Consultants Ltd cannot and does not accept any responsibility for errors and omissions in, or the currency of sufficiency of the provided information.

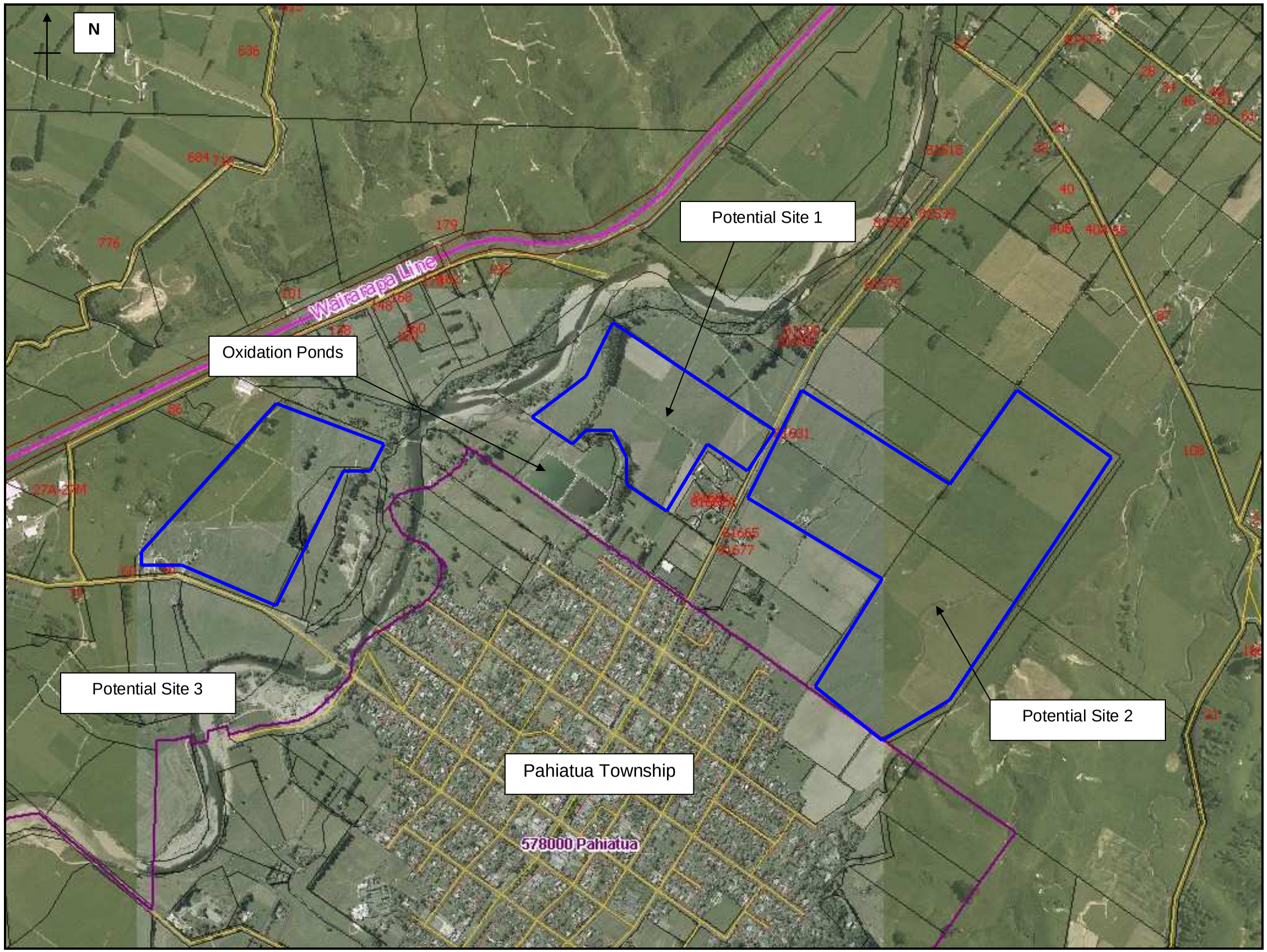
Should conditions be exposed during development that differ significantly from those expected then Wai Waste Environmental Consultants Ltd should be contacted immediately in order to review and if necessary amend any recommendations accordingly.

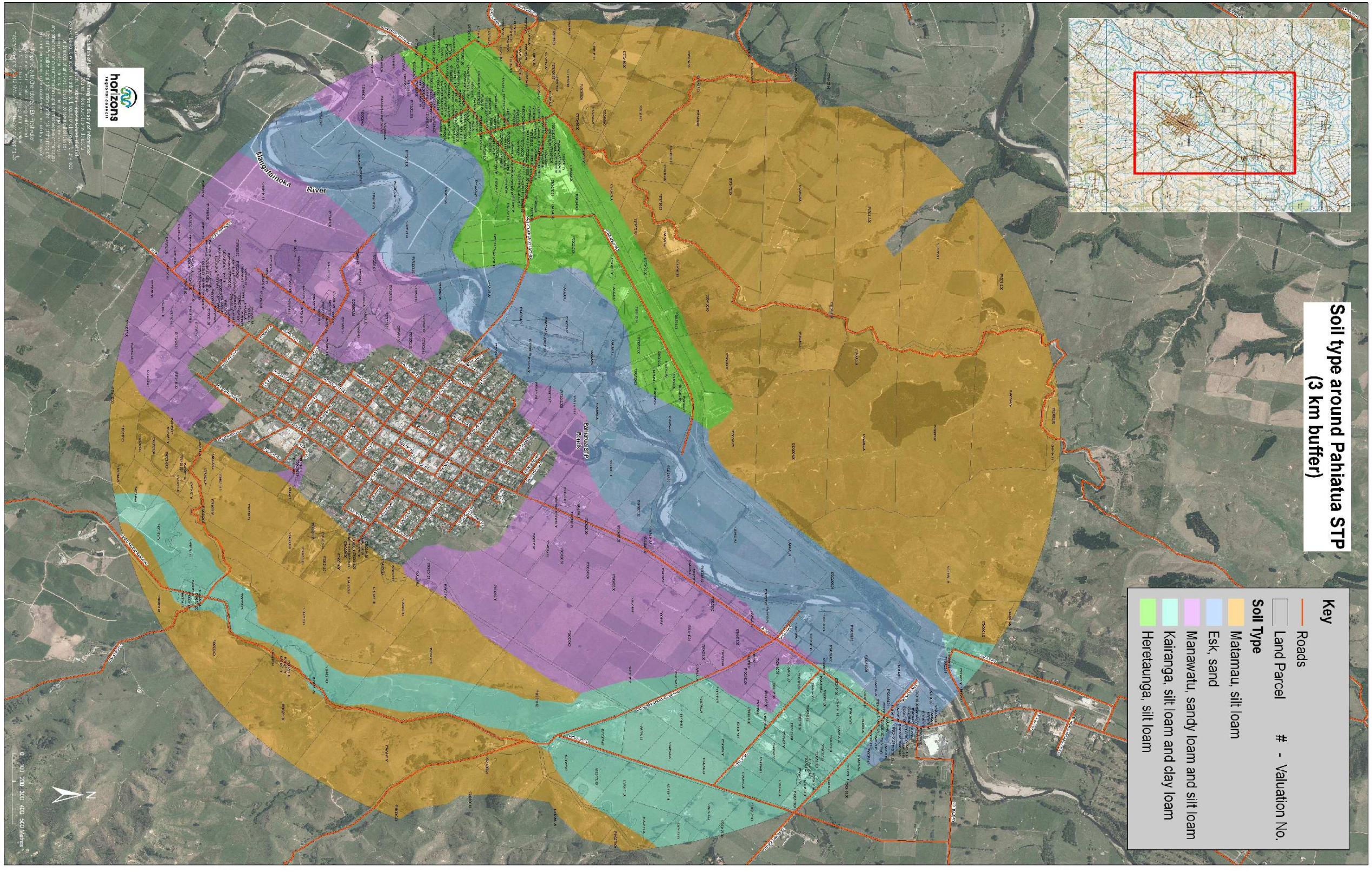
Should any third party wish to use or rely upon the contents of the report, written approval from Wai Waste Environmental Consultants Ltd must be sought. Wai Waste Environmental Consultants Ltd accepts no responsibility or liability for:

- The consequences of this document being used of purposes other than for which it was commissioned; and
- This report being used by any other party other than the organisation by whom it was commissioned.

# APPENDIX A

# AERIAL PHOTOGRAPH


N
Potential Site 1
Oxidation Ponds
Wairarapa Line
Potential Site 3
Pahiatua Township
578000 Pahiatua
Potential Site 2


Soil type around Pahiatua STP
(3 km buffer)
Key
Roads
Land Parcel
# - Valuation No.
Soil Type
Matamau, silt loam
Esk, sand
Manawatu, sandy loam and silt loam
Kairanga, silt loam and clay loam
Heretaunga, silt loam
Manganaioka River
Pahiatua STP
Pahiatua
horizons regional council
N
0 50 100 200 300 400 500 Metres

# APPENDIX B

# LABORATORY TEST RESULTS

# Pahiatua STP at Tertiary Oxidation Pond

| Date | DRP (HRC) | Ammoniacal-N (HRC) | TSS (HRC) | TN (HRC) | TON (HRC) | Nitrate (HRC) | Nitrite (HRC) | TP (HRC) | Turbidity EPA (HRC) | Black Disc (HRC) | sCBOD5 (HRC) | E. coli by MPN (HRC) | Enterococci (HRC) | Volatile Matter (HRC) | Total Coliforms (HRC) | SSC (HRC) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5/10/2010 10:15 | 1.697 | 11.2 | 12 | 14 | 0.69 | 0.58 | 0.11 | 2.01 | 9.27 | 0 | 2.8 | 2 | 17 | 8 | >5261 | |
| 2/11/2010 10:10 | 1.708 | 11.9 | 10 | 16 | 0.88 | 0.73 | 0.15 | 1.88 | 8.68 | 0 | 4.3 | 310 | 816 | 7 | 12240 | |
| 7/12/2010 11:15 | 3.46 | 14.4 | 32 | 20.5 | 0.125 | 0.075 | 0.05 | 3.97 | 20 | 0 | 3.7 | 306 | 3400 | 28 | >4840 | |
| 11/01/2011 10:10 | 0.048 | 1.4 | 5 | 4.18 | 2.488 | 2.48 | 0.008 | 0.131 | 4.91 | 0 | <2.000 | <1 | 1 | 4 | 13 | |
| 8/02/2011 10:40 | 0.026 | 1.7 | 5 | 3.7 | 2.172 | 2.17 | <0.0020 | 0.224 | 9.07 | 0 | <2.000 | 2 | 225 | 3 | 30 | |
| 8/03/2011 10:40 | 3.034 | 0.129 | 124 | 7.8 | 0.698 | 0.598 | 0.1 | 3.83 | 95.2 | 0 | <2.000 | 1850 | 727 | 70 | 51720 | 101 |
| 5/04/2011 11:25 | 0.069 | 1.7 | 6 | 4.1 | 1.794 | 1.79 | 0.004 | 0.157 | 3.94 | 0 | <2.000 | 65 | 9 | 5 | 238 | 6 |
| 10/05/2011 12:20 | 0.043 | 1.7 | 14 | 2.4 | 1.962 | 1.96 | 0.002 | 0.161 | 4.76 | 0 | <1.000 | 1 | <1 | 6 | 387 | 3 |
| 14/06/2011 12:00 | 0.084 | 1.8 | 7 | 4.9 | 2.342 | 2.34 | <0.0020 | 0.174 | 2.32 | | <1.000 | 4 | <1 | 6 | 84 | 2 |
| 5/07/2011 12:30 | 0.109 | 1.7 | <1.000 | 4.3 | 2.352 | 2.35 | <0.0020 | 0.174 | 6.23 | | <1.000 | <1 | <1 | <1.000 | 17 | <2.0000 |
| 2/08/2011 12:25 | 0.09 | 1.5 | 3 | 4.4 | 2.977 | 2.97 | 0.007 | 0.134 | 2.02 | | <1.000 | <1 | <1 | 3 | 3 | <2.0000 |
| 6/09/2011 13:00 | 0.109 | 1.7 | 6 | 5 | 2.547 | 2.54 | 0.007 | 0.175 | 1.5 | | <0.500 | <1 | <1 | 5 | 75 | 4 |
| 4/10/2011 11:30 | 0.085 | 1.5 | 3 | 4.5 | 2.632 | 2.63 | 0.002 | 0.153 | 4.89 | | <0.500 | 2 | <1 | 3 | 490 | <2.0000 |
| 8/11/2011 11:45 | 2.89 | 17 | 10 | 22 | 0.58 | 0.47 | 0.11 | 2.94 | 6.6 | | 1.5 | 690 | 210 | 9 | >240000 | 8 |
| 6/12/2011 13:15 | 2.9 | 14 | 10 | 16 | 0.58 | 0.56 | 0.025 | 4 | 5.22 | | 1 | 5300 | 980 | 7.6 | 16000 | 11 |
| 17/01/2012 13:55 | 0.084 | 1.9 | 3.6 | 4.9 | 2.1 | 2.1 | 0.006 | 0.12 | 4.09 | | <0.500 | 63 | 6 | 3.6 | 220 | <1.0000 |
| 14/02/2012 11:35 | 0.006 | 2.4 | 12 | 4.8 | 1.7 | 1.6 | 0.081 | 0.41 | 4.42 | | <0.500 | 190 | 110 | 7.2 | 2600 | 3.8 |
| 6/03/2012 13:10 | 0.48 | 0.7 | 10 | 2.9 | 1.8 | 1.7 | 0.11 | 0.66 | 5.41 | | 1.1 | 1200 | 150 | 10 | 17000 | 13 |
| 17/04/2012 14:50 | 2.8 | 3.5 | 5.2 | 5.2 | 0.23 | 0.18 | 0.044 | 3 | 3.36 | | 0.72 | 330 | 2100 | 1.2 | 61000 | 8.1 |
| 8/05/2012 13:55 | 0.08 | 1.9 | 1.8 | 3.6 | 2 | 2 | 0.008 | 0.14 | 3.09 | | <0.500 | <1 | <1 | 1.8 | 18 | 1.7 |
| 12/06/2012 13:30 | 0.11 | 1.8 | 2.4 | 26 | 2.2 | 2.2 | 0.0092 | 0.16 | 2 | | <0.500 | 2 | <1 | 2.4 | 40 | 3 |
| 14/08/2012 13:35 | 0.073 | 1.9 | 3.8 | 4.1 | 2.6 | 2.6 | 0.0031 | 0.22 | 3.8 | | <0.500 | 1 | <1 | 3.2 | 260 | 1.1 |
| 11/09/2012 14:00 | 0.093 | 1.902 | 0 | 4.865 | 2.4229 | 2.413 | 0.0099 | 0.127 | 1.75 | | 1 | 4 | 4 | 0 | | 0 |
| 9/10/2012 12:45 | 3.101 | 8.903 | 6 | 11.573 | 1.3108 | 1.2093 | 0.1015 | 3.227 | 5.83 | | 2 | 192 | 4 | 6 | | 5 |
| 13/11/2012 12:40 | 2.838 | 6.021 | 8 | 9.778 | 2.3724 | 2.048 | 0.3244 | 3.059 | 6.86 | | 1 | 39 | 8 | 6 | | 8 |
| 11/12/2012 13:15 | 0.03 | 1.918 | 1 | 3.374 | 2.0024 | 1.9979 | 0.0045 | 0.185 | 4.45 | | 1 | 4 | 4 | 1 | | 1 |
| 10/07/2022 14:40 | 1.8 | 13 | 19 | 15 | 1.7 | 1.6 | 0.079 | 2.4 | 9.5 | | <0.500 | 920 | 91 | 18 | 29000 | 35 |
| Average | | 4.784185185 | | 8.513704 | | | | | | | | | | | | |

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| | |
|---|---|
| TO | Dave Watson, Tararua District Council |
| COPY | Tabitha Manderson, Opus Palmerston North |
| FROM | Morgelyn Leizour |
| DATE | 11 December 2014 |
| FILE | 5-P0531.01 |
| SUBJECT | Pahiatua WWTP Upgrades |

# 1 Introduction

## 1.1 Background

Over the time since the previous consent was granted for operation of Pahiatua WWTP, the Horizons One Plan has been adopted. A series of water quality targets are integral to the One Plan – they define the concentrations of key nutrient species (among other variables), which will allow the identified fresh water values to be achieved. The One Plan identifies that meeting the water quality targets for surface waters in the region will require improvement in the quality of wastewater discharged to surface waters, as well as changes to land use practices.

The Pahiatua WWTP discharge consent is due for renewal and a number of upgrades are underway at the WWTP in order to improve the quality of the discharge into the Mangatainoka River. The Pahiatua WWTP discharges within 'Mana_8'; one of the Horizon One Plan's Priority Catchments (Refer to Appendix A).

## 1.2 Scope

Tararua District Council (TDC) is seeking a new discharge permit for the Pahiatua WWTP, this discharge permit is for an upgraded system. The Council is seeking advice from Opus as to the anticipated improvements in effluent quality resulting from each of the planned process upgrades, both underway and proposed.

# 2 WWTP Flows and Loading

## 2.1 Domestic Loading

The population of Pahiatua township is approximately 2,500[1] in roughly 1,000 households. While there are septic tanks in the surrounding Mangatainoka district, the Pahiatua WWTP does not accept septic waste so this does not contribute to the loading. The population

[1] 2013 Census recorded 2,412 people

decreased slightly between the 2006 and 2013 censuses and no significant population growth is projected.

No data is available on the influent characteristics of the wastewater as there has been no historical sampling of the raw wastewater entering the WWTP. Estimates of the likely loading have been made based on the census data and typical per capita loading rates. These estimates are summarised in Table 1 below.

**Table 1: Estimated loading on Pahiatua WWTP**

| Parameter | Units | Estimated Loading |
|---|---|---|
| **BOD** | kg/day | 200 |
| **COD** | kg/day | 513 |
| **TSS** | kg/day | 196 |
| **$NH_3$-N** | kg/day | 19.4 |
| **TKN** | kg/day | 16.8 |
| **TP** | kg/day | 33.6 |

## 2.2 Trade Waste

A Fonterra dairy factory and Tui brewery are both located on the outskirts of the town however each has its own wastewater treatment and disposal systems.

There is no other significant industry discharging effluent to the WWTP.

## 2.3 Flow data

In the absence of flow data, flows into the WWTP have been estimated at an average of 550$m^3$/day. This figure was derived using a flow of 0.220$m^3$/person/day[2], a conservative figure in order to allow for some inflow and infiltration. However, without any actual data or knowledge of the system, it is possible that this estimate is quite wrong.

## 2.4 Existing Effluent Quality

Data on the existing effluent quality has been provided in the form of 41 sample results taken between 5/10/2010 and 18/02/2014 and an additional 14 sample results taken between 11/12/2012 and 28/01/2104 by HRC. As a portion of the data does not appear credible in the absence of tertiary treatment processes at the WWTP, a conservative approach has been taken and the data has been 'cleaned' by removing figures below the threshold of what would be expected from an oxidation pond system like Pahiatua. This cleaning process is fairly arbitrary given that there is no information on the quality or volume of wastewater entering

[2] Based roughly on typical residential flows from Metcalf & Eddy

the WWTP. Only results which are not believed to be feasible from the existing plant have been removed from the data set in order to minimise manipulation of the data.

This approach has been taken to ensure a realistic assessment of the future effluent quality once the upgrades have occurred. However it should be noted that the resulting mean concentrations may t still represent a higher level of treatment than the plant is realistically achieving as there is insufficient data to draw any conclusions. Collecting additional effluent sample data once the new upgrades are in place, as well as influent data, will assist in refining future effluent quality expectations and give greater certainty.

The filtered and edited data is summarised in Table 2~~Table 3~~ below.

**Table 23: Filtered and edited effluent concentration data (5/10/10-18/02/14)**

| Parameter | Mean Concentration (mg/L) | | Value below which data removed in edited data |
|---|---|---|---|
| | Filtered Data | Edited Data | |
| **Ammoniacal Nitrogen** | 4 | 4 | 1 |
| **DRP** | 0.7 | 2 | 0.3 |
| **E Coli** | 284 | 886 | 50 |
| **Nitrate** | 2 | 2 | - |
| **Nitrite** | 0.04 | 0.04 | - |
| **Total Coliforms** | 19,197 | 29,417 | 200 |
| **Total Nitrogen** | 7 | 7 | - |
| **Total Oxidised Nitrogen** | 2 | 2 | - |
| **Total Phosphate** | 0.9 | 3 | 0.5 |
| **Total Suspended Solids** | 8 | 36 | 10 |
| **Turbidity** | 8 | 8 | - |
| **Volatile Matter** | 6 | 22 | 7.5 |

# 3 WWTP Prior to Upgrades

## 3.1 Description of WWTP Prior to Upgrades

The WWTP, prior to the upgrades commencing, consisted of three oxidation (facultative) ponds and a river discharge. Pond 1 currently has two aerators and Pond 2 has one aerator however an old aerator will be removed from Pond 1 as part of the upgrades, leaving one aerator on each of the first two ponds. There are baffle curtains in Pond 3.

Facultative ponds rely on biological processes for wastewater treatment. Generally coarse solids will settle on the bottom of the ponds, forming a sludge layer where anaerobic treatment occurs. Aerobic treatment occurs in the upper layers of the pond. Various organisms facilitate the treatment process function at different levels in the pond.

Facultative ponds primarily reduce BOD and bacteria. The aerobic stabilization of carbonaceous BOD is primarily dependent on heterotrophic bacterial activity. Heterotrophic bacterial activity is primarily a function of temperature and oxygen availability. Generally good levels of BOD reduction can be achieved in facultative pond system.

Various forms of nitrogen are found in wastewater, most often ammonia, nitrate and organic nitrogen. Typically organic nitrogen is converted to ammonia by bacteria. Ammonia can be removed in an oxidation pond through losses to the atmosphere, being assimilated into bacteria and algal cell and bacterial nitrification (which may be followed by denitrification). Adequate levels of dissolved oxygen (generally levels of 2.0 mg/l is recommended) for nitrification to occur. As the nitrifying bacteria do not compete well with heterotropic bacteria for D.O. and nutrients, before nitrification can take place, BOD levels need to have been reduced so avoid this competition. Accordingly, in a well-functioning pond system nitrification would be expected to occur in the final stages of a pond system. In general, the longer the detention time, the more likely nitrification will occur.

## 3.2 Effluent Quality Prior to Upgrades

Overall, the WWTP appeared typical of oxidation pond systems in similarly sized towns across NZ and its performance was also comparable or better, even when data that did not appear credible had been filtered and edited.

Mean effluent quality results from Pahiatua WWTP and a number of other similar plants are shown in Table 3~~Table 4~~.

**Table 3~~4~~: Mean effluent concentrations from other WWTPs around NZ**

| Site | Description | $cBOD_5$ | TSS | $NH_3$-N | TKN | DRP | TP | FC | E.coli | Ent |
|---|---|---|---|---|---|---|---|---|---|---|
| **Bulls** | 2 pond + aerator | 13 | | 6 | | | 7.3 | | | 325 |
| **Ratana** | 2 pond + aerator | 15 | 48 | 8 | | 1.9 | | | | 250 |
| **Gore** | 2 pond + aerator | 29 | 56 | 14 | 24 | 3.5 | 4.8 | | 2301 | |
| **Leeston** | 8 pond + aerator | 22 | 63 | 17 | 23 | | | | | |
| **Queenstown** | 3 pond + aerator | 36 | 65 | 31 | 38 | | 6 | 44100 | | |
| **Woodend** | 2 pond + aerator + UV | 10 | 59 | 15 | 27 | | 9 | 430 | 430 | 202 |
| **Rangiora** | 2 pond + aerator | 38 | 78 | 17 | | 3.8 | | 4350 | 4285 | 465 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Pahiatua (Filtered data))** | 3 pond + aerator | | 36 | 4 | 7 | 2 | 3.0 | | 866 | |

## 3.3 Changes Made to the WWTP in Recent Years

A number of small improvements have been made to the WWTP in recent years:

- The ponds were desludged, lined with clay and refurbished in 2002-2003.
- A single Reliant aerator and a single HPE cage aerator were added to Pond 1 however the old HPE cage aerator will be removed as part of the new upgrades.
- A further aerator was added to Pond 2.
- Mixing walls were installed in Pond 3.

The addition of aeration to the ponds would have reduced BOD and normally increased ammonia oxidation. Effectively, mechanical aeration increases the oxidation capacity of the ponds beyond what it would be when naturally aspirated by the wind. Desludging and installing mixing walls would have increased the hydraulic retention time, giving a higher probability of increasing nitrification and bacterial and viral removal rates.

An initial assessment of the wastewater discharge indicated that changes that have been made to the wastewater treatment process over the period 2008-2010 have delivered quantifiable improvements to the quality of the wastewater discharge.[3] With two exceptions (nitrate-nitrogen and total organic nitrogen concentrations), the discharge is currently exerting a smaller impact on the Mangatainoka River than was the case in 2009.

# 4 Proposed WWTP Upgrades

## 4.1 WWTP Process Flow Diagram

An annotated aerial image showing the plant, including existing and proposed upgrades, is appended (Appendix B). The processes are also displayed in the process flow diagram (PFD) in Figure 1~~Figure 1~~ below.

[3] *Pahiatua Wastewater Treatment Plant Consent Renewal: Assessment of Environmental Effects*. Opus, July 2014.

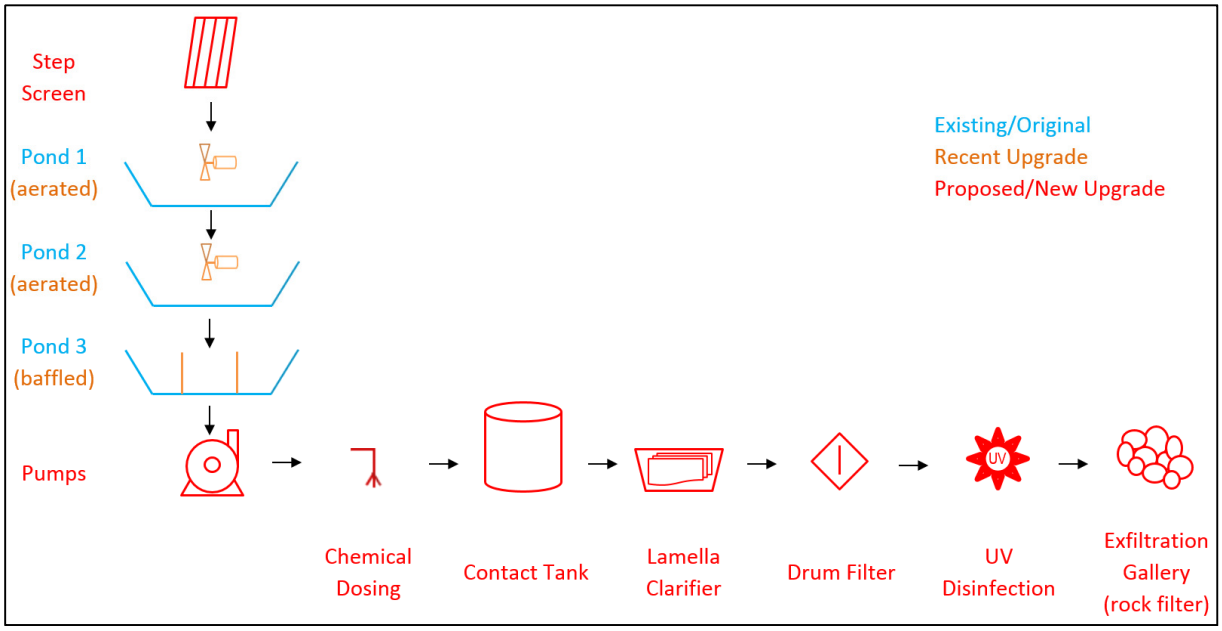



**Figure 1 WWTP PFD, including existing and proposed upgrades**

## 4.2 Upgrades Underway

Several upgrades are currently underway:

- A new, at grade, Huber Step Screen is being installed currently in 2014 (Figure 2~~Figure 2~~).
- TDC is in the process of installing a lamella plate clarifier, including a contact tank for coagulation and a chemical dosing facility (Figure 3~~Figure 3~~).

**Figure 2: Step screen installed in 2014**

**Figure 3: Installation of lamella plate clarifier (left) and contact tank (right) in progress (2014)**

## 4.3 Proposed Further Upgrades

The following upgrades are also either proposed or are in the process of delivery:

- An In-Eko drum filter has been ordered from Brick House
- A UV disinfection system will also be installed.
- A Tephra filter may be installed.

Following UV disinfection, the treated effluent will be back fed into an old water intake line and discharged out to the Mangatainoka River through the old 'Infiltration' Gallery. This will give better dispersion and mixing in the river.

# 5 Effluent Quality Improvements

There is insufficient influent and effluent quality data available to be able to accurately quantify the improvements resulting from the upgrade work undertaken to date. Collecting additional sample data once the upgrades are in place, as well as influent data, will give more certainty about the WWTP performance and future effluent quality.

Anticipated effluent quality improvements resulting from upgrades are described by process in the following sections.

## 5.1 Step Screen

The Huber step screen will remove coarse material from the influent wastewater stream that could damage or clog downstream process equipment and the exfiltration gallery or introduce coarse contaminants to the Mangatainoka River. Although the screen will not dramatically improve the performance of the WWTP, it will slightly reduce the rate at which sludge accumulates in the ponds and it will help mitigate breakdowns in the new, more intensive unit processes.

## 5.2 Lamella Plate Clarifier

Lamella clarification is a counter-current settling process in which a series of inclined plates or tubes enhance the separation and removal of solids from the effluent. The addition of a flocculant in the contact tank before the clarifier promotes the aggregation of small particles into larger particles to further enhance their removal by gravity settlement in the clarifier.

A Filtec Lamella Settler has been purchased from Filtration Technology Ltd. Details are as follows:

| | |
|---|---|
| **Model** | Lamella Settler |
| **Max. hydraulic capacity** | 80m³/hr (approx. 22L/s) |
| **Proposed flocculant** | Unknown |

The performance of coagulation and flocculation and therefore of the clarification process, is dependent on a large number of factors, many of which are interrelated. Wastewater characteristics, chemical dose rates, mixing conditions, flocculation times, the selection of chemicals and their order of addition, can all affect performance. Control of pH and alkalinity is also essential to maintain performance. We have approached the suppliers for their comment on the likely performance of their equipment, as supplied for this installation, but have received no response.

The lamella clarifier will be expected to provide improvements in a number of areas of plant performance:

- Total suspended solids via coagulation and settlement
- Total nitrogen via removal organic n in particulate material
- Dissolved reactive phosphorous

## 5.3 Drum Filter

The drum filter removes additional suspended solids and lowers turbidity by mechanical sieving. This will also increase the effectiveness of the existing UV disinfection system.

An In-Eko Microscreen has been ordered from Brickhouse. Details are as follows:

| | |
|---|---|
| **Model** | **In-Eko 4FBO Microscreen Drum Filter** |

| | |
|---|---|
| **Max. hydraulic capacity** | Design 20L/s up to 50L/s |
| **Filtration cloth** | 0.020mm |
| **Max TSS loading** | 150mg/L TSS on inlet at 50L/s |

The effectiveness of filtration depends on the filter and filter cloth itself as well as the flow rate and the suspended solids characterisation in terms of concentration, degree of flocculation and particle size distribution. This can be particularly variable following oxidation pond systems.

The In-Eko cloth drum filter proposed will be expected to provide some small incremental benefits over the lamella clarifier. These will principally be gained by 'mopping up' floc. particles that are carried over from the clarifier, particularly during periods of fluctuating flow rates:

- Algae particles less than 20 microns diameter will pass directly through the filter largely unaffected.
- Some improvement in effluent TSS. The quantum will depend on the clarifier performance. Poor clarifier performance will result in better filter performance, in terms of percentage of solids removed.
- Very small improvements could be expected to the TN and TP levels in the effluent but only by virtue of the organic N & P in the filtered particles.

## 5.4 UV Disinfection

Radiation from ultraviolet (UV) light can be an effective bacteriocide and virucide. Since UV light is not a chemical agent, no toxic residuals are produced.

It is understood that TDC intend to purchase TrojanUV3000 PTP UV disinfection system from Trojan Technologies Inc. Details are assumed to be as follows:

| | |
|---|---|
| **Model** | **TrojanUV3200K PTP** |
| **Peak hydraulic flow rate** | 12.3L/s |
| **Validated UV dose** | 31,023 µWs/cm² |
| **Total number of lamps** | 8 |

The effectiveness of UV disinfection depends on the turbidity and solids content of the effluent as solids can both absorb the ultraviolet energy and shield microorganisms. Further, dissolved organic substances, including colour, can absorb significant proportions of the UV light and further reduce disinfection efficiency. The performance of the UV disinfection is therefore dependant on the performance of the upstream treatment processes, including the lamella clarifier and the drum filter.

Given a minimum effluent UV Light transmissivity (design values are currently uncertain), low effluent suspended solids and service flow rates that are within the design limitations of the selected system, the UV disinfection will inactivate bacteria, viruses and protozoa. The extent of inactivation depends upon the particular microbe (some are much tougher than others) and the dose rate provided.

Treating oxidation pond effluent, with no tertiary treatment of the effluent, a UV system, appropriately designed would be expected to deliver performance of between 1 and 1.5 $log_{10}$ inactivation of faecal indicator bacteria. With an effective tertiary or set of tertiary unit processes in place, low suspended solids, low dissolved colour, and the dose rate indicated above, an inactivation rate of between 2 and 3 $log_{10}$ could be expected.

## 5.5 Summary of Anticipated Effluent Quality Improvements

Anticipated effluent quality improvements resulting from the upgrades are summarised in Table 4~~Table 5~~ below.

**Table 45 Summary of anticipated effluent quality improvement**

| Process Upgrade | Affected Effluent Parameters | Anticipated Improvement* | Confidence Rating (1-10, low-high) | Reason for Confidence Rating |
|---|---|---|---|---|
| **Inlet screen** | Gross Solids | Protection of downstream mechanical equipment | 10 | No Numeric |
| **Lamella Clarifier** | TSS, | TSS – 60% | 4 | No pilot results |
| | TN, | TN – 60% of 3mg/l | 4 | Filtered data indicates 3mg/l Organic N in SS. But TSS not reliable |
| | DRP, | DRP to approx. 0.5mg/l** | 7 | Essentially tunable with coagulant |
| | | Small reduction in faecal indicator bacteria by physical removal. | 7 | Experience with other solids removal processes. |
| **Drum Filter** | TSS, TN, TP | 40% of Clarifier carry over. Small TSS particles will go straight through filter. | 4 | Vague Kaeo pilot trials. No trials on low TSS effluent & therefore no indication of %age less than 20 micron. |
| **UV Disinfection** | Bacteria, Viruses, Protozoa | 2 - 3 $Log_{10}$ Inactivation | 6 | Based on a good tertiary effluent but not specified dose. |

* Based on Table 2~~Table 3~~ numbers above

** Depending upon chemical dose rate and clarifier up flow rate.

It is important to note, however, the questions raised about the credibility of the effluent sample results, as outlined in Section 3 above. It is of some concern that the effluent quality that we would predict from these combined processes, following the upgrades, could still be worse than the WWTP performance that is currently reported.

# 6 Conclusions and Recommendations

Based on the available effluent quality sample data, performance of the existing Pahiatua WWTP is as good as or better than any other WWTP in New Zealand. Overall, the WWTP appears typical of oxidation pond systems in similarly sized towns across NZ and its performance is also comparable or better, even when data that did not appear credible has been filtered.

It is very difficult to accurately predict the effluent quality following completion of the upgrades, given the number of unknowns about both the influent wastewater and the details of the proposed upgrades. Estimates of the anticipated improvements in effluent quality have been made, based on data from similar plants around the country (refer to Table 4~~Table 5~~). Confidence in these estimates is low due to the number of unknowns. In order to calculate potential performance with more certainty, additional monitoring following the installation of the upgrade equipment is recommended.

## 6.1 Monitoring Recommendations

The quality of the effluent following the upgrades will undoubtedly be improved, however the effluent quality that we would predict following the process upgrades could still be worse than the WWTP performance that is currently reported due to the credibility of the existing effluent sample results. It is therefore strongly recommended that a rigorous sampling regime is implemented with the frequencies detailed below:

- Influent
  - » Take 24 hour composite samples every 6 or 8 days (in order to sample on a different day each week) for a month or two, then monthly for the balance of a year.
  - » Sample $cBOD_5$, TKN, TP. Alkalinity.
- Commissioning Phase
  - » Sample daily or multiple times per day for a duration of two weeks
  - » Sample TSS, DRP and UVT at the Pond 3 outlet and after the clarifier and the filter in order to confirm the improvement across each new tertiary process
  - » Sample full list of analytes at discharge (after UV disinfection)
- Trial Operation Phase
  - » Sample three times a week (Monday, Wednesday and Friday) for a duration of four weeks
  - » Sample full list of analytes at discharge (after UV disinfection)
- Normal Operation and Consent Compliance
  - » Sample full list of analytes fortnightly at discharge (after UV disinfection)
  - » Sample between each unit process (ponds, clarifier, filter) quarterly

The full list of effluent analytes to be sampled (except in between unit processes as detailed above) is as follows:

- Composite Samples
  - » $cBOD_5$
  - » Ammonia
  - » TKN
  - » TN
  - » DRP
  - » TP
  - » TSS

- Grab Samples
  - » UVT%
  - » pH
  - » E.coli

# 7 References

*Pahiatua Wastewater Treatment Plant Consent Renewal: Assessment of Environmental Effects*. Opus, July 2014.

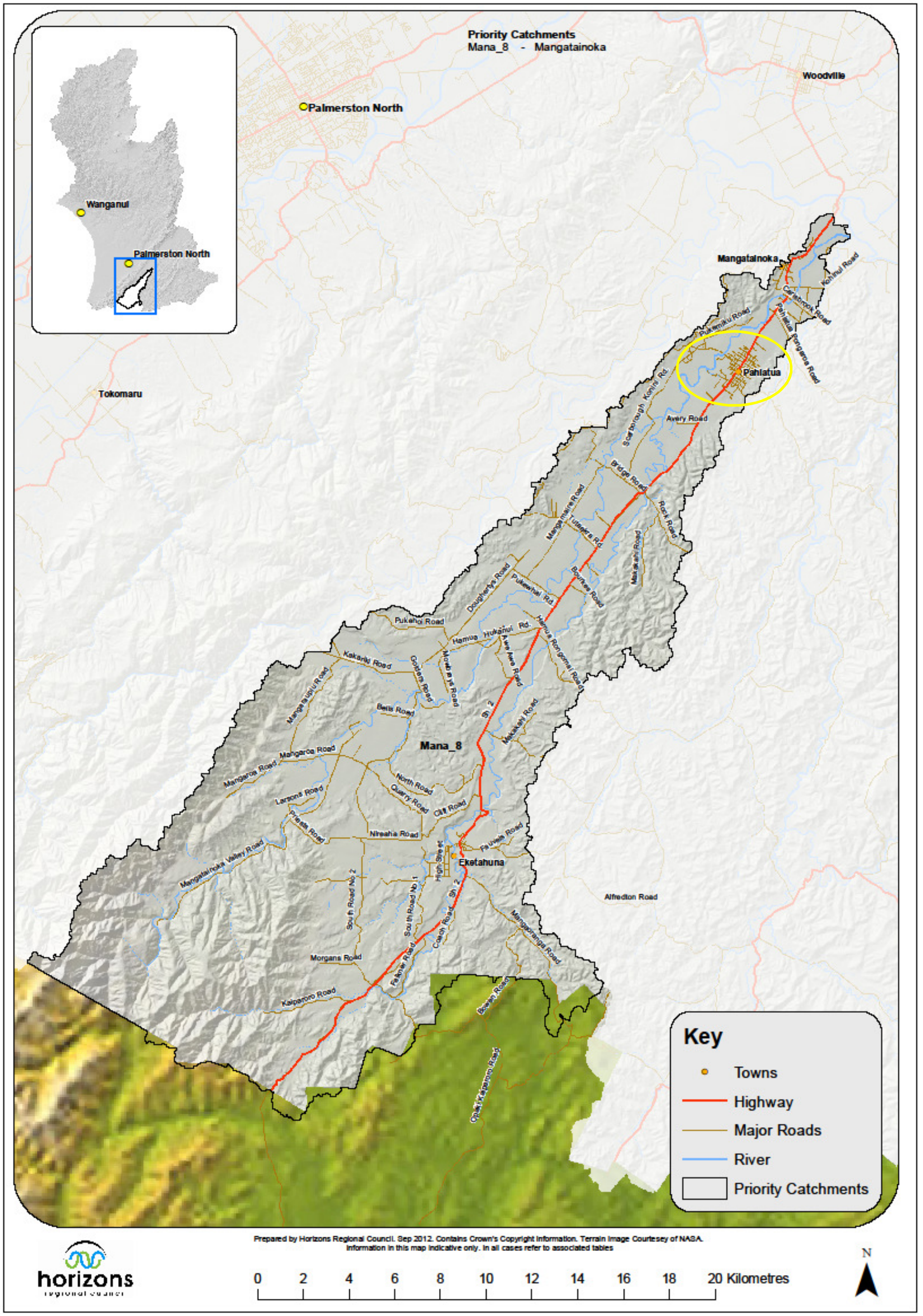
Metcalf & Eddy, Inc., Tchobanoglous, George, and Burton, Frank. *Wastewater Engineering: Treatment, Disposal and Reuse*. 5th Ed. Boston: McGraw-Hill, 2013.

Metcalf & Eddy, Inc., Tchobanoglous, George, and Burton, Frank. *Wastewater Engineering: Treatment, Disposal and Reuse*. 3rd Ed. Boston: McGraw-Hill, 1991.

# Appendices

Appendix A – Priority Catchments
Appendix B – Annotated Aerial Image of WWTP

# Appendix A – Priority Catchments



# Appendix B – Annotated Aerial Image of WWTP