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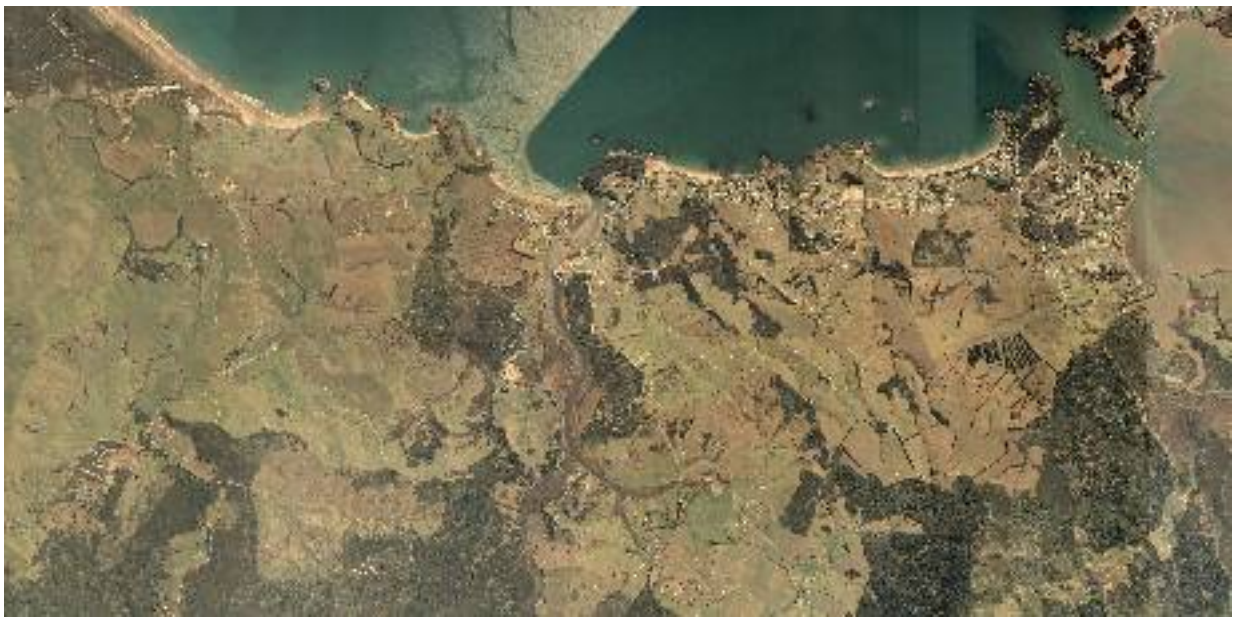
FAR NORTH DISTRICT COUNCIL

East Coast Bays Wastewater Treatment System Resource Consent 4007 Renewal



Response to Section 92

EAST COAST BAYS WASTEWATER TREATMENT SYSTEM RESOURCE CONSENT 4007 RENEWAL

Response to Section 92

PREPARED FOR

Far North District Council

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Executive Summary

This report has been prepared by VK Consulting Environmental Engineers Ltd (VKCEE) on behalf of the Far North District Council (FNDC) in relation to the application for renewal of resource consent 4007 for the East Coast Bays Wastewater Treatment System.

The report is prepared specifically in response to the request for further information received from the Northland Regional Council (NRC) dated 12 June 2008.

The request for further information requested the applicant to address the following concern; *"Our specific concern relates to the effects this discharge may have on the receiving environment, including the unnamed tributary that receives the discharge, the Parapara Stream, the Awapoko River, and ultimately the coastal water adjacent to Aurere Beach."*

This report addresses the request for further information as follows:

1. Additional assessment of risk to downstream environment and users in terms of pathogen contaminants including comparison to upstream conditions.
2. Additional assessment of downstream environment in terms of nutrients including comparison to upstream conditions.
3. An assessment of heavy metals discharged into the receiving environment.
4. A summary of the above in terms of risk to the community.

Pathogen Risk Assessment

Based on the results of monitoring to date the following can be concluded:

1. The current wastewater treatment plant does not pose a risk in terms of stock water, as the faecal coliform monitoring results are within the acceptable range for stock drinking at the discharge point itself, without any allowance being made for reasonable mixing at the compliance point.
2. The treatment plant currently poses an acceptable risk in terms of contact recreation with regards to the median results for E. coli.

   Discharge monitoring shows median E coli levels are compliant with the contact recreation standards in the Regional Water and Soil Plan for Northland (RWSP). There are however some samples which have

exceeded the allowable maximum for a designated bathing area. It must be noted that these are samples at the **discharge**, not after reasonable mixing. Recent monitoring indicates there are already significant levels of E coli in the background samples within the catchment in areas unaffected by the wastewater discharge.

3. The tributary of the Parapara Stream **upstream** of the discharge point does not comply with the MfE guidelines for shellfish growing waters in terms of faecal coliforms, but Iwi have indicated that the closest shellfish are at Aurere Beach which is approximately 9 km downstream.

   The NRC monitoring shows that the discharge of treated effluent does have a slight effect on the level of faecal coliforms immediately downstream of the discharge with a slight increase after mixing. However recent FNDC monitoring also indicates significant levels of faecal coliforms in the background samples within the catchment in areas unaffected by the wastewater discharge.

Nutrient Risk Assessment

The following conclusions can be drawn from the nutrient assessment:

1. The East Coast Bays WWTP currently has only a minor effect on nitrogen loads into the discharge catchment, contributing only 2.95% of the total nitrogen into the catchment.

2. The proposed upgraded system will be better than the current system in terms of ammonia with the proposed reduction in ammonia levels to meet the ANZECC 2000 limits.

Heavy Metal Risk Assessment

The discharge of heavy metals from the East Coast Bays WWTP is within an acceptable range, and generally compliant with all standards included in the RWSP. Therefore the risk to the community is minimal.

Comparisons with other Contaminants in the Catchment

The East Coast Bays Wastewater Treatment Plant is not the only source of contamination within the catchment. Other sources of contamination could include:

- Quarries
- Farm effluent
- Domestic Wastewater Treatment
- Fertilisers

All of these sources need to be taken into account when analysing the effect of the wastewater treatment plant on the catchment and ultimately the public health risk posed.

Section 1

1. Introduction

This report has been prepared by VK Consulting Environmental Engineers Ltd (VKCEE) on behalf of the Far North District Council (FNDC) in relation to the application for renewal of resource consent 4007 for the East Coast Bays Wastewater Treatment System.

The report is prepared specifically in response to the request for further information received from the Northland Regional Council (NRC) dated 12 June 2008.

1.1 Request for Further Information

A summary of the specific information requested is presented below. A copy of the full request is included as Appendix A.

"Our specific concern relates to the effects this discharge may have on the receiving environment, including the unnamed tributary that receives the discharge, the Parapara Stream, the Awapoko River, and ultimately the coastal water adjacent to Aurere Beach.

We consider that additional information is needed to help establish what risk the discharge from the East Coast Bays Wastewater Treatment Plant poses, currently and at your forecast rate of 1570 m³/day, to users of the receiving waters. This risk assessment may include, but not be limited to, the use of the receiving waters for:

- *Stock drinking;*
- *Contact recreation;*
- *Food gathering; and*
- *Shellfish gathering.*

The risk assessment should include the public health risk posed by the discharge, in particular from pathogens in the wastewater, and the risk of the discharge causing adverse effects on the environment, either from particular contaminants (eg ammonia) or cumulative effects (eg. nutrients and heavy metals)."

Therefore this report will address the request for further information as follows:

1. Additional assessment of risk to downstream environment and users in terms of pathogen contaminants including comparison to upstream conditions;
2. Additional assessment of downstream environment in terms of nutrients including comparison to upstream conditions;
3. An assessment of heavy metals discharged into the receiving environment; and
4. A summary of the above in terms of risk to the community.

Section 2

2. Amendments to Application

During the course of the preparation of this response to the Section 92 request from NRC and in consultation with the local community a change has been made to the application. This is detailed below:

1. Flow

The original application lodged with the NRC included for an increase in the average daily dry weather flow from 1,005m³/day to 1,570 m³/day to accommodate anticipated growth within the area during the 25 year time frame applied for.

In discussions between FNDC and stakeholders, it has been indicated that the preferred option is that no increase in the consented flow is allowed. The applicant has decided that the application will be revised so that the flow will remain at the current consented volume of 1,005m³/day.

2. Pathogen Disinfection

The issue of upgrading the East Coast Bays Wastewater Treatment Plant to include specific unit processes for pathogen disinfection (such as ultra violet light) has been discussed with a number of stakeholders during the consultation process. FNDC has instructed that at this stage they do not intend to upgrade the East Coast Bays WWTP to include this.

Section 3

3. Assessment of Risk from Pathogens

The issue of pathogens discharged from wastewater treatment plants into receiving waters is critical to the health and well being of the general population. As requested, this section focuses on the risks of discharging pathogens from the East Coast Bays WWTP.

Firstly it must be noted that the successful collection and treatment of wastewater in a controlled reticulated sewerage scheme has successfully eliminated many diseases which have been prevalent within communities. No longer are septic tank based systems suitable for urbanised communities and territorial authorities must ensure that the wastewater is successfully collected and treated.

The request for further information has outlined four factors that the risk assessment must focus on. These are listed below and will be the focus of the risk assessment:

- Stock drinking;
- Contact recreation;
- Food gathering; and
- Shellfish gathering.

3.1 Summary of Monitoring Results

The report titled *"East Coast Bays Wastewater Treatment System Resource consent 4007 – Renewal – Supporting Information"* dated May 2008[1] outlined a summary of monitoring results carried out by Northland Regional Council. The summary is again included in this report.

3.1.1 Discharge Monitoring

Between September 1990 and December 2007 the Northland Regional Council has completed monitoring for faecal coliforms on 96 occasions at NRC

sampling site: 101687 *"Taipa Sewage Treatment System @ Number 4 marsh discharge"*. Based on the 96 samples the following results were returned:

- Median result 200 cfu/100ml
- Ninety percentile result 1,065 cfu/100ml
- Eighty percentile result 580 cfu/100ml
- Maximum result 30,000 cfu/100ml

3.1.2 Receiving Environment Monitoring

Resource Consent 4007 applies the following limits for faecal coliforms in the receiving environment (the unnamed tributary of the Parapara Stream):

2. The discharge shall not cause the water quality in the unnamed tributary of the Parapara Stream at NRC Sample Site No 5941 (see NRC Plan No. 3078, attached), to fall below the following standards:

. . .

d) The median concentration of the faecal coliform bacteria in the water shall not exceed 600 per 100 millilitres, and the 80 percentile concentration shall not exceed 2400 per 100 millilitres, based on not fewer than 5 samples taken over any 30 day period.

NRC has also supplied receiving environment monitoring for the period beginning August 2001. The results, along with the monitoring of the discharge during that period, are presented below:

Table 3.1: Faecal Coliform Receiving Environment Monitoring

	Upstream (5939)	Downstream (5941)	Discharge (1687)	Consent Compliance
No of Samples	10	11	27	
Median cfu/100ml	150	190	200	600
Ninety percentile cfu/100ml	674	600	940	N/A
Eighty percentile cfu/100ml	460	570	536	2400
Maximum result cfu/100ml	800	2200	3800	N/A

These results show that the levels of faecal coliform in the unnamed tributary of the Parapara Stream are below the levels required by the resource consent conditions.

3.2 Risk Assessment in Terms of Stock Drinking

Section 7.6.11 of the Regional Water and Soil Plan for Northland[2] (RWSP) sets the following limits with regards to faecal coliforms and stock drinking:

"Until such time as a water body is classified and associated water quality standards set in place, the Council will use the following guidelines for management of waters for stock water and irrigation purposes:

After reasonable mixing, the contaminant, either by itself or in combination with other contaminants, is not likely to:

(b) Based on no fewer than 5 samples over any 30 day period, cause the following faecal coliform counts to be exceeded:

- *Median less than 600/100 millilitres*
- *80 percentile less than 2,400/100 millilitres*

as measured by the membrane filter technique."

The monitoring results undertaken by NRC (included in Section 3.1) indicate that the levels of faecal coliforms are currently well within the levels above for stock drinking.

Therefore there is minimal risk to stock drinking from the discharge of treated effluent from the East Coast Bays WWTP.

3.3 Risk Assessment in Terms of Contact Recreation

Section 7.6.8 of the RWSP[2] sets the following limits with regards to E. Coli and contact recreation:

"Until such time as a water body is classified and associated water quality standards set in place, the Council will use the following guidelines for management of waters for contact recreation purposes:

After reasonable mixing, the contaminant either by itself or in combination with other contaminants, is not likely to:

(c) Render the water unsuitable for bathing by the presence of contaminants.

(d) Cause the median of samples taken over a bathing season to exceed 126 E coli per 100 millilitres, and no sample to exceed the following upper limit:

Upper Limit per 100 ml	*Designated Bathing Area*	*Moderate Use*	*Light Use*	*Infrequent Use*
E coli	*235*	*293*	*410*	*576*

Sampling for E. coli at the **discharge** from the wetland has been completed by NRC on 13 occasions since August 2004. The following results were returned:

- Median result 85 MPN/100ml
- Ninety percentile result 1,220 MPN/100ml
- Eighty percentile result 582 MPN/100ml
- Maximum result 4,611 MPN/100ml

Of the 13 samples taken, the median result (85 MPN/100ml) is well below the median limit set over a bathing season (126 E. coli per 100ml), however four of the 13 samples exceeded the upper limits for a designated bathing area.

It must however be acknowledged that these results are for the **discharge** of treated wastewater from the wetland. They are not the results after reasonable mixing at the compliance point 5941. No sampling for E. coli has been undertaken at this point. It can be assumed that the levels of E. coli after mixing will be less than those measured at the discharge point.

It must also be noted that the Parapara Stream is not a designated bathing area and that it is unlikely that significant amounts of bathing will occur prior to the Awapoko River and Aurere Beach. Therefore the risk to contact recreation from this treatment system is reduced.

3.4 Risk Assessment in Terms of Food Gathering

From discussions with local Iwi Ngati Kahu, (pers comm. V Holloway, 2008) the applicant has become aware that the downstream environment is used for food gathering. This food includes eel within the waterways and shellfish at Aurere Beach. An assessment of the effects of the wastewater treatment plant on these food resources is therefore presented.

A site visit was carried out on 24 July with Ngati Kahu representatives to view locations of shellfish beds. These beds were at the mouth of the Awapoko River and along Aurere Beach.

3.4.1 Faecal Coliform

The Ministry for the Environment[3] (MfE) sets standards for shellfish growing waters in terms of faecal coliforms. These standards are as follows:

- Median = 14 cfu/100ml
- Ninety percentile = 43 cfu/100ml

When these standards are compared to the results shown in Section 3.1.2, two points can be made:

1. The level of faecal coliforms in the unnamed tributary of the Parapara Stream after mixing (median = 190cfu/100ml) is greater than the stated standards for shellfish growing waters.

2. The level of faecal coliforms in the unnamed tributary of the Parapara Stream upstream of the discharge point (median = 150cfu/100ml) is **also** above the levels specified by the MfE Guidelines.

Therefore while the discharge of treated effluent to the unnamed tributary of the Parapara stream is causing an increase to the levels of faecal coliforms, the level of faecal coliforms in the unnamed tributary upstream of the discharge also exceeds that required by the MfE Guidelines.

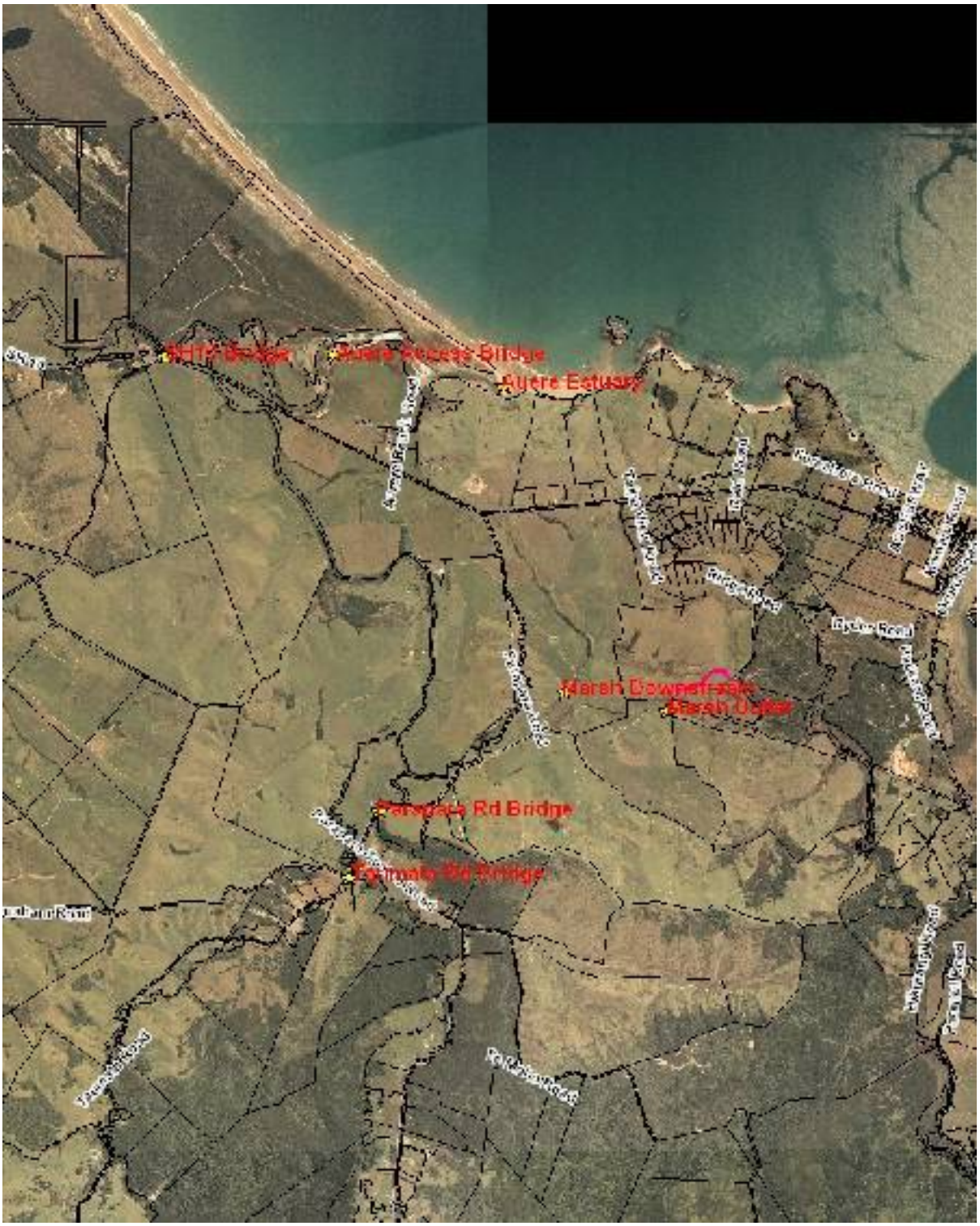
3.5 Additional Receiving Environment Monitoring

The Far North District Council has also recently undertaken receiving environment monitoring in January and February 2009 at 7 points throughout the downstream catchment, including at 3 background sites. The locations of the monitoring sites are described as follows:

- Discharge Point (NRC Site 1687)
- Receiving environment after mixing (NRC Site 5941)
- Parapara Rd Bridge (Background Site unaffected by WWTP)
- Taumata Rd Bridge (Background Site unaffected by WWTP)
- State Highway 10 Bridge (Background Site unaffected by WWTP)
- Aurere Access Bridge
- Aurere Estuary

The locations of the monitoring sites are also shown on Figure 3.1.

Figure 3.1: Monitoring Sites Location Plan



3.5.1 Faecal Coliforms

A summary of the faecal coliform monitoring at each site is included below:

Table 3.2: Additional Faecal Coliform Receiving Environment Monitoring

Site	Median (No/100ml)
Discharge Point (NRC Site 1687)	800
Receiving Environment after mixing (NRC Site 5941)	1700
Parapara Rd Bridge (Background Site)	100
Taumata Rd Bridge (Background Site)	800
State Highway 10 Bridge (Background Site)	200
Aurere Access Bridge	450
Aurere Estuary	100

Key

_____ Affected by wastewater

_____ Background site not affected by wastewater

Median of 4 samples

A summary of these results are presented below:

- The median level of faecal coliforms downstream of the discharge point (after mixing) is consistently higher than the discharge level (800cfu/100ml vs 1700cfu/100ml). This indicates that the level of faecal coliforms upstream of the discharge point is higher than the level of faecal coliforms in the discharge. Samples were requested upstream of the discharge point but these were not able to be taken due to access issues.

- The median level of faecal coliforms in the background sample at the Parapara Rd Bridge is low at 100cfu/100ml.

- The median level of faecal coliforms in the background sample at the Taumata Rd Bridge is high at 800cfu/100ml. This level of faecal coliform is similar to that discharged from the East Coast Bays WWTP.

- The median level of faecal coliform at the background site of State Highway 10 Bridge is of average quality (200 cfu/100ml) indicating

there is background level of contamination present within this catchment.

- The median level of faecal coliform at the Aurere access bridge is of average quality and slightly higher than the background sample of State Highway 10 Bridge (450 cfu/100ml vs 200 cfu/100ml).
- The median level of faecal coliform at the Aurere estuary is of good quality (100 cfu/100ml).
- Overall the median level of faecal coliforms in the discharge is comparable to the background site at the Taumata Rd Bridge, but not as good as the background site at Parapara Rd Bridge. The levels of faecal coliform gradually decrease as the water flows through the catchment and at the Aurere Estuary the levels are below 100cfu/100ml. The monitoring undertaken indicates that overall the discharge of wastewater is not having a significant effect on the catchment in terms of faecal coliforms and that faecal coliforms are naturally occurring in the catchment as demonstrated by the levels at the background sites of Taumata Rd Bridge and State Highway 10 Bridge.

3.5.2 E. Coli

A summary of the E. coli monitoring at each site is included below:

Table 3.3: Additional E coli Receiving Environment Monitoring

Site	Median (No/100ml)
Discharge Point (NRC Site 1687)	277
Receiving Environment after mixing (NRC Site 5941)	715
Parapara Rd Bridge (Background Site)	30
Taumata Rd Bridge (Background Site)	457
State Highway 10 Bridge (Background Site)	1300
Aurere Access Bridge	3085
Aurere Estuary	445

Key

Affected by wastewater

Background site not affected by wastewater

Median of 4 samples

A summary of these results are presented below:

- The median level of E coli downstream of the discharge point (after mixing) is consistently higher than the discharge level (277cfu/10ml vs 715cfu/100ml). This indicates that the level of E coli upstream of the discharge point is higher than the level of E coli in the discharge.

- The median level of E coli in the background site at the Parapara Rd Bridge is low at 30cfu/100ml. Of all of the sites monitored this is the only site with E coli levels less than the levels of E coli at the discharge point from the WWTP. This indicates that E coli levels in the catchment are predominantly coming from sources other than the East Coast Bays WWTP.

- The median level of E coli in the background site at the Taumata Rd Bridge is high at 457cfu/100ml. This level of faecal coliform is higher than that discharged from the East Coast Bays WWTP (277 cfu/100ml).

- The median level of E coli at the background site of State Highway 10 Bridge is of poor quality (1300 cfu/100ml) indicating there is a significant background level of contamination present within this catchment and is considerably higher than that discharged from the East Coast Bays WWTP.

- The median level of E coli at the Aurere access bridge is of very poor quality.

- The median level of E coli at the Aurere estuary is of reasonable quality when compared to the other samples taken within the catchment (445 cfu/100ml). Only two samples present better quality water and those are the Parapara Rd Bridge background sample and the discharge from the East Coast Bays WWTP.

- Overall the median levels of E coli within the catchment are high except for the background sample at the Parapara Rd Bridge. The second best sample is actually the discharge from the East Coast Bays WWTP followed by the Aurere Estuary at the bottom of the catchment.

- The monitoring undertaken indicates that overall the discharge of wastewater is not having an adverse effect on the catchment in terms of E coli and that significant E coli levels are naturally occurring in the catchment as demonstrated by the levels at the background sites of Taumata Rd Bridge and State Highway 10 Bridge.

3.6 Summary

Based on the results of monitoring to date and the proposed upgrades the following can be concluded:

1. The current wastewater treatment plant does not pose a risk in terms of stock water, as the faecal coliform monitoring results are within the acceptable range for stock drinking at the discharge point itself, without any allowance being made for reasonable mixing at the compliance point.

2. Based on the NRC monitoring the tributary of the Parapara Stream **upstream** of the discharge point does not comply with the MfE guidelines for shellfish growing waters in terms of faecal coliforms, but Iwi have indicated that the closest shellfish are at Aurere Beach which is approximately 9 km downstream. The discharge of treated effluent does have a slight effect on the level of faecal coliforms with a slight increase after mixing.

3. Recent monitoring by FNDC (Jan-Feb 2009) indicates that the median level of faecal coliforms in the discharge is comparable to the background site at the Taumata Rd Bridge, but not as good as the background site at Parapara Rd Bridge. The levels of faecal coliform gradually decrease as the water flows through the catchment and at the Aurere Estuary the levels are below 100cfu/100ml. The monitoring undertaken indicates that overall the discharge of wastewater is not having a significant effect on the catchment in terms of faecal coliforms and that faecal coliforms are naturally occurring in the catchment as demonstrated by the levels at the background sites of Taumata Rd Bridge and State Highway 10 Bridge.

4. The treatment plant currently poses an acceptable risk in terms of contact recreation with regards to the median results for E. coli. Discharge monitoring shows median E coli levels are compliant with the contact recreation standards in the RWSP. There are however some samples which have exceeded the allowable maximum for a designated bathing area. It must be noted that these are samples at the **discharge**, not after reasonable mixing. The additional monitoring carried out in January and February 2009 indicates that the levels of E coli within the catchment are high even at background sample sites and that the discharge is not having an adverse effect on the levels of E coli within the catchment.

Section 4

4. Assessment of Nutrients

An assessment of nutrients has been requested by NRC in relation to the East Coast Bays Wastewater Treatment Plant.

The request for further information has outlined four factors that the risk assessment must focus on. These are listed below and will be the focus of the risk assessment:

- Stock drinking;
- Contact recreation;
- Food gathering; and
- Shellfish gathering.

4.1 Summary of Monitoring Results

The report titled *"East Coast Bays Wastewater Treatment System Resource Consent 4007 – Renewal – Supporting Information"* dated May 2008[1] outlined a summary of monitoring results carried out by Northland Regional Council. The summary is again included in this report.

4.1.1 Discharge Monitoring

Between September 1990 and December 2007 NRC has completed discharge monitoring for ammoniacal nitrogen on 47 occasions at NRC sampling site: 101687 *"Taipa Sewage Treatment System @ Number 4 marsh discharge"*. Based on the 47 samples the following results were returned:

- Median result 1.32 g/m^3
- Ninety percentile result 21.3 g/m^3
- Eighty percentile result 15.0 g/m^3
- Maximum Result 28.7 g/m^3

4.1.2 Receiving Environment Monitoring

NRC has also supplied receiving environment monitoring for the period between August 2001 and March 2005. The results, along with the monitoring of the discharge for the period from August 2001 to 17 December 2007, are presented below:

Table 4.1: Ammoniacal Nitrogen Receiving Environment Monitoring

	Upstream (5939)	Downstream (5941)	Discharge (1687)
No of Samples	11	12	29
Median g/m³	0.07	2.55	7.2
Ninety Percentile g/m³	0.28	8.8	22.5
Eighty Percentile g/m³	0.1	4.55	21.0
Maximum result g/m³	1.36	11.9	28.7

The above results can be compared to the NRC guidelines (contained in the resource consent) and the ANZECC 2000 guidelines[4]. These guidelines show that at times the East Coast Bays WWTP is not compliant in terms of ammonia discharges to the receiving environment. Further ammonia removal is required.

4.2 Assessment of the Effects of Nutrients on the Catchment

The discharge of nutrients can have a detrimental effect on the receiving environment. These nutrients can be from both wastewater treatment plants and the surrounding catchment, particularly agricultural land.

An assessment of the nutrient discharges has been performed on the catchments that the East Coast Bays WWTP discharges to.

The following assessment of nutrients uses a mass balance approach to assess the ammonia/nitrate discharges from the East Coast Bays WWTP compared to other ammonia/nitrate inputs into the catchments.

4.2.1 Mass Balance Methodology

This approach uses a mass balance over the catchment which accounts for nitrogen inputs from diffuse source discharges (from the land catchment). These are compared to the nitrogen inputs into the catchment from the East

Coast Bays WWTP. Point source discharges (concentrated discharges to surface waters in the catchment from dairy shed effluent) were also assessed.

Nitrogen inputs are estimated based on the following factors:

- Land use e.g. dry stock farming, dairy farming, forestry
- Nitrogen discharge per unit area from each land use (diffuse source discharge)
- Area of each land use
- Inputs from treated dairy shed effluent discharges based on consented discharge volumes multiplied by average discharge concentrations.

The degree of accuracy depends on the level of detail used to investigate the above factors. A desktop analysis can provide an estimate of the diffuse source inputs but more extensive work is required to estimate the contribution from all point source discharges. The following assumptions were therefore used to estimate the nitrogen loadings into the streams from the catchment:

- Land uses contributing to nitrogen loads are primarily pastoral and forest/scrub (respective land areas were estimated from land resource inventory maps and aerial photographs).
- The only significant point source discharges contributing to nitrogen loadings are from dairy shed effluents discharging to surface waters.
- Urban runoff does not have a significant contribution to the nitrogen loads into the catchment.

The level of ammonia to be discharged from the ECB WWTP was based on the current performance of the treatment plant of 7.5 mg/l of ammonia. No monitoring is available for nitrate-nitrogen so an estimate of 2.5 mg/l was therefore assumed for nitrate-nitrogen.

Detailed calculations are given in Appendix B.

4.2.2 Results of Mass Balance – Full Catchment

The mass balance approach estimates the total amount of nitrogen discharged to the catchment from sources other than the East Coast Bays WWTP is 330kg/day. This is a combination of 160kg/day of ammonia nitrogen and 170kg/day of nitrate-nitrogen.

By comparison, the treated wastewater discharge from the East Coast Bays WWTP at the current consented flowrate of 1,005 m^3/day will contribute 7.5 kg/day of ammonia-nitrogen (4.5% of the total catchment loadings) and 2.5 kg/day of nitrate-nitrogen (1.5% of the total catchment loadings) into the catchment.

Overall the East Coast Bays WWTP will contribute approximately 2.95% of the total nitrogen inputs to the catchment at the current consented flowrate of 1,005m^3/day.

4.2.3 Conclusions

The following conclusions can be drawn from the nutrient assessment:

1. The mass balance above demonstrates that the East Coast Bays WWTP will have only a minor effect on the total nitrogen load into the discharge catchment, contributing only 2.95% of total nitrogen.

2. Reductions in the total nutrients discharged to the receiving environment from the East Coast Bays WWTP will not have a significant overall effect on the total nutrients within the catchment. For example if a 50% reduction in overall nutrients is achieved, this will only be a 1.5% reduction in the total nutrients discharged to the catchment.

3. The proposed upgraded system will be significantly better than the current system in terms of ammonia with the proposed reduction in ammonia levels to meet the ANZECC 2000 limits.

4.3 Risk Assessment in Terms of Stock Drinking

Section 7.6.11 of the RWSP[2] sets the following limits with regards to nutrients and stock drinking:

"Until such time as a water body is classified and associated water quality standards set in place, the Council will use the following guidelines for management of waters for stock water and irrigation purposes:

After reasonable mixing, the contaminant, either by itself or in combination with other contaminants, is not likely to:

(c) Cause the level of nutrients to fall outside the range of:

Nitrate (NO_3-N) 500 mg/m^3"

A number of low-land rivers within the Northland Region will exceed this limit[5]. It can therefore be considered as more of an aspirational goal than a realistic goal. However exceedance of the limit has more effect on nuisance growth rather than risk to stock health.

No specific monitoring of the receiving environment has been completed in terms of nitrates.

4.4 Risk Assessment in Terms of Contact Recreation

Section 7.6.8 of the RWSP[2] outlines the relevant limits with regards to contact recreation and nutrients. In this section there are no limits set on nutrients.

4.5 Risk Assessment in Terms of Food Gathering

The RWSP[2] does not specifically state any nutrient limits with regards to food gathering. However an assessment can be made by comparing safe levels of contaminants for aquatic ecosystems as there is a direct link between safe ecosystem populations and food sources such as eel and fish. For these food sources to continue to be present in the catchment the levels of nutrients (especially ammonia) need to be at safe levels.

The applicant has therefore proposed that a condition be placed on the consent:

"The discharge shall not cause the water quality in the unnamed tributary of the Parapara Stream at NRC Sample Site No 5941 (see NRC Plan No. 3078, attached), to fall below the following standards:

The moving average of five consecutive samples of total ammoniacal N shall not exceed the following: (this condition shall not take effect until 3 years after the issue of the consent to allow for upgrading).

ANZECC (2000) 95% protection guideline for slightly to moderately disturbed freshwater systems.

pH of water at the time of sampling	*Total Ammoniacal Nitrogen ([NH_3 + NH_4]-N) (grams per cubic metre)*
6.0	*2.57*
6.1	*2.56*
6.2	*2.54*
6.3	*2.52*
6.4	*2.49*
6.5	*2.46*
6.6	*2.43*
6.7	*2.38*
6.8	*2.33*
6.9	*2.26*
7.0	*2.18*
7.1	*2.09*
7.2	*1.99*
7.3	*1.88*
7.4	*1.75*
7.5	*1.61*
7.6	*1.47*
7.7	*1.32*

7.8	*1.18*
7.9	*1.03*
8.0	*0.90*
8.1	*0.78*
8.2	*0.66*
8.3	*0.56*
8.4	*0.48*
8.5	*0.40*
8.6	*0.34*
8.7	*0.29*
8.8	*0.24*
8.9	*0.21*
9.0	*0.18*

"Compliance with the moving average of five consecutive monitoring samples is to be determined as follows: Determine each monitoring sample concentration as a percentage of the ANZECC (2000) guideline concentration. If the moving average percentage concentration of five consecutive monitoring samples exceeds 100% then non-compliance has occurred."

This condition will ensure an acceptable ecosystem in terms of ammonia inputs and will thus also protect the food resources which are sensitive to this parameter.

Section 5

5. Assessment of Heavy Metals

An assessment of heavy metals has been requested by the Northland Regional Council in relation to the East Coast Bays Wastewater Treatment Plant.

The request for further information has outlined four factors that the risk assessment must focus on. These are listed below and will be the focus of the risk assessment:

- Stock drinking;
- Contact recreation;
- Food gathering; and
- Shellfish gathering.

5.1 Summary of Monitoring Results

The applicant has recently undertaken a series of sampling from the **discharge** of treated effluent from the East Coast Bays WWTP. Six samples were taken. The results are below:

Table 5.1: Heavy Metal Discharge Monitoring

Parameter	Median (mg/m^3)	Maximum (mg/m^3)
Arsenic	1.25	1.3
Cadmium	<0.053	<0.053
Chromium	<0.53	0.54
Copper	2.05	4.7
Lead	0.205	0.48
Mercury	<0.08	<0.08
Zinc	6.6	10

5.2 Risk Assessment in Terms of Aquatic Ecosystems and Stock Drinking

Section 7.6.7 of the RWSP[2] sets the following limits with regards to heavy metals and aquatic ecosystems:

"Until such time as a water body is classified and associated water quality standards set in place, the Council will use the following guidelines for the management of waters for aquatic ecosystem purposes:

After reasonable mixing the contaminant either by itself or in combination with other contaminants, is not likely to;

(d) Cause levels of toxic metals to exceed the following, except where caused by natural events:

- *Total arsenic 50 mg/m³*
- *Total cadmium 0.2 – 2* mg/m³*
- *Total chromium 2 mg/m³*
- *Total copper 2 – 5 mg/m³*
- *Total lead 1 – 5 mg/m³*
- *Total zinc 5 – 50* mg/m³*
- *Total mercury 0.1 mg/m³*

**depending on hardness, see ANZECC guidelines."*

Furthermore Section 7.6.11 of the RWSP[2] sets the following limits with regards to heavy metals and stock drinking:

"Until such time as a water body is classified and associated water quality standards set in place, the Council will use the following guidelines for management of waters for stock water and irrigation purposes:

After reasonable mixing, the contaminant, either by itself or in combination with other contaminants, is not likely to:

(a) Cause levels of toxic metals to exceed the following, except where caused by natural events:

- *Total arsenic 100 mg/m³*
- *Total cadmium 10 mg/m³*
- *Total chromium 1,000 mg/m³*
- *Total copper 200 mg/m³*
- *Total lead 100 mg/m³*
- *Total zinc 2,000 mg/m³"*

A summary of the heavy metal sampling results and comparison to the aquatic ecosystem and stock water drinking is presented in Table 5.2 below.

Table 5.2: Heavy Metal Discharge Monitoring Comparison with Standards

Parameter	Median mg/m³	Maximum mg/m³	RWSP Stock Water Standard mg/m³	RWSP Aquatic Ecosystems Standard mg/m³	
				Low	High
Arsenic	1.25	1.3	100	50	N/A
Cadmium	<0.053	<0.053	10	0.2	2
Chromium	<0.53	0.54	1,000	2	N/A
Copper	2.05	4.7	200	2	5
Lead	0.205	0.48	100	1	5
Mercury	<0.08	<0.08	N/A	0.1	N/A
Zinc	6.6	10	2,000	5	50

The above comparison demonstrates that the discharged wastewater from the East Coast Bays Wastewater Treatment Plant does not pose a risk in terms of heavy metals for either stock water or aquatic ecosystems. There is a slight exceedance of the low limits for aquatic ecosystems for copper and zinc, however the maximum results for both parameters are well below the high level thresholds at the discharge. Further dilution will occur in the receiving environment, thus reducing the risk further.

5.3 Risk Assessment in Terms of Contact Recreation

Section 7.6.8 of the RWSP[2] outlines the relevant limits with regards to contact recreation and heavy metals. In this section there are no limits set on heavy metals. Therefore in terms of contact recreation heavy metals are not deemed a relevant parameter.

5.4 Risk Assessment in Terms of Food Gathering

Based on the results of the heavy metal monitoring and comparison with relevant standards (in particular the stricter aquatic ecosystem standards) there is minimal risk to downstream users in terms of food gathering and heavy metals.

5.5 Conclusions

The discharge of heavy metals from the East Coast Bays WWTP is within an acceptable range, and generally compliant with all standards included in the RWSP. Therefore the risk to the community is minimal.

Section 6

6. Comparison with other Sources of Contamination

The East Coast Bays Wastewater Treatment Plant is not the only source of contamination with the catchment. Other sources of contamination could include:

- Quarries
- Farm effluent
- Domestic wastewater treatment
- Fertilisers

All of these sources will need to be taken into account when analysing the effect of the wastewater treatment plant on the catchment and ultimately the public health risk posed.

6.1 Quarries

There are a number of quarries within the Awapoko River Catchment. These quarries will have discharges (in particular stormwater) to the waterways of the catchment.

Monitoring data received from NRC indicates that the discharges from the quarries in terms of heavy metals may exceed that allowed for in the RWSP in terms of both aquatic ecosystems and stock water.

A state of the environment monitoring report (2003) was supplied by NRC for the Dangens and Blacks Quarries[6]. A summary of the monitoring results compared against relevant standards is included as Table 5.1 and Table 5.2.

Table 6.1: Monitoring Results for Blacks Quarry (2003)

Parameter	Upstream mg/m³	Point of Discharge mg/m³	Downstream mg/m³	RWSP Stock Water Standard mg/m³	RWSP Aquatic Ecosystems Standard mg/m³	
					Low	High
Arsenic	<10	2	<5	100	50	N/A
Cadmium	4.7	10.7	8.6	10	0.2	2
Chromium	8	61	42	1,000	2	N/A
Copper	35	203	145	200	2	5
Lead	<1	1.2	1.1	100	1	5
Mercury	<0.08	<0.08	<0.08	N/A	0.1	N/A
Zinc	660	1150	990	2,000	5	50
Nickel	320	622	504	N/A	N/A	N/A

Key

Exceeds both the Stock Water and Aquatic Ecosystem Standards

Exceeds the Stock Water Standards

The above results for Blacks Quarry indicate that the upstream catchment is naturally high in heavy metals and that the levels of cadmium, chromium copper and zinc exceed the standards for aquatic ecosystems. However the discharge of heavy metals from this quarry is having an effect on the downstream levels after mixing with increases in the levels of these metals. The level of heavy metals downstream is still below the stock water drinking levels for all the metals measured.

Table 6.2: Monitoring Results for Dangens Quarry (2003)

Parameter	Point of Discharge mg/m³	Downstream mg/m³	RWSP Stock Water Standard mg/m³	RWSP Aquatic Ecosystems Standard mg/m³	
				Low	High
Arsenic	130	110	100	50	N/A
Cadmium	55.3	54.1	10	0.2	2
Chromium	492	497	1,000	2	N/A
Copper	1660	1680	200	2	5
Lead	2	2	100	1	5
Mercury	<0.08	<0.08	N/A	0.1	N/A
Zinc	14,800	14,900	2,000	5	50
Nickel	3510	3600	N/A	N/A	N/A

Key

Exceeds both the Stock Water and Aquatic Ecosystem Standards

Exceeds the Stock Water Standards

The above results for Dangens Quarry indicate that the levels of heavy metals in the downstream catchment are high. Exceedances of both the stock water drinking standards and the aquatic ecosystem standards are present for arsenic, cadmium, copper, and zinc. This may be cause for concern, however no conclusions can be drawn due to the lack of an upstream sample and as this is only one sample occasion.

6.2 Farm Effluent

There are nine dairy farms within the catchment area that have consents to discharge waste[7]. Of these nine dairy farms eight of the consents are to discharge wastewater into the waterways of the catchment. A list of the consented daily discharges is below:

- RC 10477 14m³
- RC 951501 7.5m³
- RC 8689: 6.5 m³

- RC 12303: 26.5 m^3
- RC 8734: 16 m^3
- RC 800068: Irrigates to land
- RC 20851: 7 m^3
- RC 12470: 12.5 m^3
- RC 9001: 7m^3
- **Total** **87m^3/day**

In discussions with Northland Regional Council staff[7] they advise the following with regards to the dairy farm effluent discharges within the catchment:

- There were some significant issues with the dairy farm effluent discharges in this catchment, as there were with most dairy farm effluent discharges in Northland, prior to NRC's concerted effort about 5 to 6 years ago to raise the standard for dairy farm effluent.

- Consent 10477 is just downstream of where the compliance point is for the discharge from the East Coast Bays Wastewater Treatment Plant. This discharge had some issues in 2005/2006 where there was untreated effluent being discharged into water from a concrete race. NRC advises that this has been resolved and that the treatment system has now been operating satisfactorily.

- At the moment there is only one outstanding significant compliance issue relating to RC9001, which is at the head of the catchment. NRC expects this issue to be resolved prior to them beginning this seasons milking.

6.3 Domestic Wastewater Treatment

Far North District Council has recently implemented a bylaw requiring all on-site wastewater treatment systems such as septic tanks to be inspected and obtain a warrant of fitness every three years. This process has begun.

Current inspections to date have provided the following information regarding on-site wastewater treatment systems within the catchment:

- Total number of systems: 96
- Number of systems inspected: 88
- Number of systems needing attention: 9
- Percentage of systems needing attention: 10%

The above information shows that there are failing septic tanks within the area. As part of the FNDC's on-site wastewater by-law, the faults within these systems are required to be remedied.

6.4 Fertilisers

It is assumed that fertilisers for farming practices will be widely used within the catchment. This will cause additional non-point source runoff of nutrients into the waterways. The issue of fertilisers was included within the nutrient balance included in Section 4.

6.5 Summary

The contaminants that could pose a risk within the Awapoko River catchment are not solely limited to the discharge of treated effluent from the East Coast Bays Wastewater Treatment Plant. Other contaminants as discussed in this section, such as dairy farm effluent and stormwater emanating from quarries, also pose a potential risk within the catchment. These other risk factors need to be taken into account when assessing the effects of the discharge of treated effluent.

Section 7

7. Conclusions

The safe treatment of community wastewater is crucial to the health and wellbeing of communities. This report has developed and expanded on the information contained in the supporting information report[1] supplied with the application for renewal of the East Coast Bays WWTP. This report demonstrates that with suitable consent conditions wastewater can continue to be treated and discharged to the tributary of the Parapara Stream.

The most important and beneficial of the upgrades proposed by the FNDC is the compliance with the ANZECC (2000) guidelines with regards to ammonia.

7.1 Pathogens

The following conclusions can be drawn regarding bacterial contamination.

The monitoring carried out to date by NRC demonstrates that the levels of indicator bacteria discharged are compliant with the relevant standards with regards to both stock water and contact recreation.

Based on the NRC monitoring the tributary of the Parapara Stream **upstream** of the discharge point does not comply with the MfE guidelines for shellfish growing waters in terms of faecal coliforms, but Iwi have indicated that the closest shellfish are at Aurere Beach which is approximately 9 km downstream. The NRC monitoring indicates that the discharge of treated effluent does have a slight effect on the level of faecal coliforms with a slight increase after mixing.

Recent monitoring by FNDC (Jan-Feb 2009) indicates that the median level of faecal coliforms in the discharge is comparable to the background site at the Taumata Rd Bridge, but not as good as the background site at Parapara Rd Bridge. The levels of faecal coliform gradually decrease as the water flows through the catchment and at the Aurere Estuary the levels are below 100cfu/100ml. The monitoring undertaken indicates that overall the discharge of wastewater is not having a significant effect on the catchment in terms of faecal coliforms and that faecal coliforms are naturally occurring in the catchment as demonstrated by the levels at the background sites of Taumata Rd Bridge and State Highway 10 Bridge.

The treatment plant currently poses an acceptable risk in terms of contact recreation with regards to the median results for E. coli. Discharge monitoring shows median E coli levels are compliant with the contact recreation standards in the RWSP. There are however some samples which have exceeded the allowable maximum for a designated bathing area. It must be noted that these are samples at the **discharge**, not after reasonable mixing. The additional monitoring carried out in January and February 2009 indicates that the levels of E coli within the catchment are high even at background sample sites and that the discharge is not having an adverse effect on the levels of E coli within the catchment.

7.2 Nutrients

The following conclusions can be drawn from the nutrient assessment:

The mass balance demonstrates that the upgraded East Coast Bays WWTP will have only a minor effect on the total nitrogen load into the discharge catchment, contributing only 2.95% of total nitrogen

The proposed upgraded system will be better than the current system with the proposed reduction in ammonia levels to meet the ANZECC 2000 limits after reasonable mixing.

7.3 Heavy Metals

The discharge of heavy metals from the East Coast Bays WWTP is within an acceptable range, and generally compliant with all standards included in the RWSP. Therefore the risk to the community from the WWTP discharge is minimal, particularly when compared with other naturally occurring sources of heavy metals in the catchment.

7.4 Other Sources of Contamination within the Catchment

There are a number of other sources of contamination within the catchment including dairy farm discharges, septic tanks and discharges from quarries. All of these could potentially pose a risk to the water quality within the catchment.

Section 8

8. References

[1] VK Consulting Environmental Engineers Ltd (2008) *Far North District Council – East Coast Bays Wastewater Treatment System Resource Consent 4007 – Renewal – Supporting Information"*

[2] Northland Regional Council (2007) *"Regional Water and Soil Plan for Northland"*

[3] Ministry for Environment (2003) *"Microbial Water Guidelines for Marine and Freshwater Recreational Areas"*

[4] Australia and New Zealand Environment and Conservation Council (ANZECC) (2000) *"Australia and New Zealand Guidelines for Fresh and Marine Water Quality"*

[5] Northland Regional Council (2006) *"Annual Monitoring Report 2005-2006"*

[6] Northland Regional Council (2003) *"State of the Environment Monitoring Report – Dangens and Blacks Quarries: Sediment and Water Quality Sampling*

[7] Emails from Stuart Savill (NRC) 20 August 2008 and 11 September 2008

[8] NZ Journal of Marine and Freshwater Research 1977/54 - Purukohukohu catchment central North Island

[9] Environment Waikato Technical publication 2006/54, *"Potential for Reducing the Nutrient Loads from the Catchments of shallow Lakes in the Waikato Region"*

[10] Environment Waikato Technical publication 2005/37 *"Nutrient Losses from Forestry in the Lake Taupo Catchment"*

[11] Ministry for the Environment (June 1992) *"Water Quality Guidelines No 1 - Guidelines for the Control of Undesirable Biological Growths in Water"*

[12] NIWA Technical Publication Series No 48 (June 1997) *"Guidelines for Constructed Wetland Treatment of Farm Dairy Wastewaters in New Zealand"* Tanner, C. C. & Kloosterman V. C.

Appendix

A

Section 92 Request

1289/10R2
"432 Request 000-AC-020608"
→ 5/7/08

NORTHLAND REGIONAL COUNCIL

Te Kaunihera a Rohe o Te Tai Tokerau

Please Quote File: 4007
AN:CK:CF

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13 JUN 2008
VK ENVIRONMENTAL

COPY FOR YOUR INFORMATION

Private Bag 9021
36 Water Street
WHANGAREI 0140
New Zealand

Phone: (09) 438 4639
Freephone: 0800 002 004
Environmental Hotline:
0800 504 639
Fax: (09) 438 0012
Email: mailroom@nrc.govt.nz

www.nrc.govt.nz

12 June 2008

Far North District Council
Private Bag 752
Kaikohe 0440

Dear Sir

RESOURCE CONSENT APPLICATION CON20080400701 – FAR NORTH DISTRICT COUNCIL – EAST COAST BAYS WASTEWATER – REQUEST FOR FURTHER INFORMATION

I refer to the above application for resource consent. As previously discussed with Stefan Kreegher of VK Consulting Environmental Engineers Ltd, further information is requested in relation to the application pursuant to Section 92(1) of the Resource Management Act 1991 (the Act).

The information is requested because the Council considers that the proposed activity may have a significant adverse effect on the environment and the information provided in your application is considered insufficient to meet the requirements of the Resource Management Act, particularly Section 88 (2)(b), and items 1(d) and 1(f)(i) of Schedule 4.

Our specific concern relates to the effects this discharge may have on the receiving environment, including the ephemeral tributary that receives the discharges, the Paihapara Stream, the Awapoko River and ultimately the coastal water adjacent to Aurere Beach.

We consider that additional information is needed to help establish what risk the discharge from the East Coast Bays Wastewater Treatment Plant poses, currently and at your forecast discharge rate of 1,070 m³/d to users of the receiving waters. This risk assessment may include, but not be limited to, the use of the receiving waters for:

- Stock drinking;
- Contact recreation;
- Food gathering, and
- Shellfish gathering.

DARGAVILLE (HQ)
61B Victoria Street
Phone: (09) 439 3300
Fax: (09) 439 3301

KAITAIA 0410
192 Commerce Street
Phone: (09) 408 6600
Fax: (09) 408 6601

OPUA 0200
Unit 10, Industrial Marine Park
Phone: (09) 402 7516
Fax: (09) 402 7510

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NORTHLAND REGIONAL COUNCIL

The risk assessment should include the public health risk posed by the discharge. In particular from pathogens in the wastewater, and the risk of the discharge causing adverse effects on the environment, either from particular contaminants (eg. ammonia) or cumulative effects (eg. nutrients and heavy metals).

It is expected that a risk assessment will include the significance of the discharge from the Wastewater Treatment Plant in relation to other point and diffuse contamination sources within the catchment of the receiving waters.

Please contact me to discuss a suitable timeframe to prepare the above risk assessment.

Please note that the Council may decline your application pursuant to Section 92A(3) of the Act if it considers that it has insufficient information to enable a decision to be made on your application. This may occur if you do not provide the information requested, and it is expected that it will be received within the agreed timeframe.

In accordance with Section 88B and 88C of the Act, the processing of your application will be placed "on hold" from the date of this letter until the date of receipt of the information requested. Once the Council has received the requested information, it will be assessed to determine its adequacy and the Council will then make a decision on whether your application requires public notification, limited notification, or whether it will be processed on a non-notified basis.

Section 357A of the Act provides you with the right to lodge an objection with the Council in respect of this request for further information. Any such objection must be made in writing setting out the reasons for the objection and must be lodged with the Council within 15 working days of the date of this letter. Please note that if you do lodge such an objection, the processing of your application would continue to be "on hold" until the objection is resolved (or otherwise withdrawn).

If you have any queries on the information requested or the other details in this letter, please contact Andrew Carvell of our Whangarei office.

Yours faithfully

Andrew Carvell
Wastewater Management Officer – Engineer

Copy for information:
Attention: S Kreegher, Far North District Council, C/- VK Consulting Environmental Engineers Ltd, PO Box 10022, Te Mai, Whangarei [illegible]

[illegible]

Appendix

B

Nutrient Mass Balance

Awapoko River – Nutrient Mass Balance – East Coast Bays WWTP

Nitrogen Loads from Diffuse Source Runoff in Awapoko River Catchment

Area of Agricultural Land for dry stock in Catchment	=	6,568 ha
Area of Dairy Farm Land in Catchment	=	990 ha
Area of Native and Exotic forested land in Catchment	=	1,307 ha
Assume negligible contribution from urban runoff		

Diffuse Source Loadings

Agricultural Dry Stock Land	=	11.1 kg/ha/yr (total nitrogen)[8, 9, 10, 11]
11.1 kg/ha/yr x 6,568 ha	=	72,904 kg/yr
Agricultural Dairy Farm Land	=	41.3 kg/ha/yr (total nitrogen)[8, 9, 10, 11]
41.3 kg/ha/yr x 990 ha	=	40,887 kg/yr
Natural and Pine forested land	=	4 kg/ha/yr (total nitrogen)[11]
4 kg/ha/yr x 1,307 ha	=	5,228 kg/yr
Total nitrogen runoff from diffuse source in the Awapoko River catchment:		
	=	119,000 kg/yr
	=	326 kg/d

Relative Proportions of NO_3 / NH_4 in Nitrogen Runoff from Diffuse Sources

Pasture[11]	50% is NO_3 50% is NH_4
Forest[11]	98% is NO_3 2% is NH_4

Point Source Loadings – Dairy Farms

Consented Discharge Volume from Dairy Farms	=	87 m^3 /day
Total Nitrogen concentration after treatment [12]	=	55 g/m^3
Total Nitrogen Discharged	=	4.7 kg/day
Total Ammonia Discharged (47.5g/m^3) [12]	=	4.1 kg/day
Total Nitrates Discharged (7.5g/m^3) [12]	=	0.65 kg/day

Ammonia Loadings from Awapoko River Catchment:

Pasture - Dry Stock	=	72,904 kg/yr x 0.5 = 36,452 kg/yr
	=	100 kg/d
Pasture – Dairy Farms	=	40,887 kg/yr x 0.5 = 20,443 kg/yr
		56 kg/day
Forest	=	5,228 kg/yr x 0.02 = 104 kg/yr
	=	0.3 kg/d
Dairy Farm – Point Source		4.1 kg/d
Total NH_4 load	=	160.4 kg/d

Nitrate Loadings from Awapoko River Catchment

Pasture - Dry Stock	=	72,904 kg/yr x 0.5 = 36,452 kg/yr
	=	100 kg/d
Pasture – Dairy Farms	=	40,887 kg/yr x 0.5 = 20,443 kg/yr
	=	56 kg/day
Forest	=	5,228 kg/yr x 0.98 = 5,123 kg/yr
	=	14 kg/d
Dairy Farm – Point Source	=	0.6 kg/d
Total NO_3 load	=	170.6 kg/d

Nitrogen Loads from the East Coast Bays Wastewater Treatment System Effluent Discharge

Proposed ADDWF	=	1,005m^3/d
Average NH_4 concentration in final discharge	=	7.5 g/m^3
Mass NH_4 loading from system	=	1,005 m^3/d x 7.5 g/m^3
	=	7.5 kg/d
Average NO_3 concentration in final discharge	=	2.5 g/m^3
Mass NO_3 loading from system	=	1,005 m^3/d x 2.5 g/m^3
	=	2.5 kg/d

Percentage Nitrogen Loads into the Awapoko River from Effluent Discharge

Ammonia (NH_4):

Total ammonia	=	160.4 kg/d + 7.5 kg/d
	=	168 kg/d
Percentage from East Coast Bays wastewater treatment effluent discharge	=	4.5%

Nitrates (NO_3):

Total nitrates	=	170.6 kg/d + 2.5 kg/d
	=	173 kg/d
Percentage from East Coast Bays wastewater treatment effluent discharge	=	1.5 %

Total Nitrogen (N)

Percentage of total Nitrogen from East Coast Bays wastewater treatment effluent discharge	=	2.95%