



APPENDICES



APPENDIX 1
PROJECT BRIEF



Specifications

Expression of Interest

**Expression of Interest for the Study of the Potential Disposal
Options for the Mangawhai Community Wastewater Scheme**

Closing Date 24 October 2013

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Part A

Background

and

Indicative Expression of Interest Programme

Part A – Background and Indicative Expression of Interest Programme

1 Background

The Mangawhai Community Wastewater Scheme (MCWS) currently disposes of the treated effluent by spray irrigation onto a council owned farm at Brown Road Mangawhai. Currently approximately 30 ha is under irrigation. With increasing numbers of connected properties the current irrigated area is insufficient to dispose of all the treated effluent in a typical year. Before proceeding to increase the irrigated area council has decided to review the options for water disposal to determine if there are more cost effective options for disposal of all or a proportion of the effluent. Council also recognises that in the medium term the farm simply does not have sufficient irrigable area to handle all the effluent and therefore desires to establish a long term strategy that takes account of this. Council therefore invites expressions of interest from consulting firms to conduct a study to review options for disposal.

2 Aims And Objectives Of Expression Of Interest (EOI) Process

The aim of the Kaipara District Council in this EOI process is to identify viable options that will deliver the best value to the Kaipara District in the long term and to understand what potential providers or partners are able to support Council in achieving its objectives.

The Expression of Interest process is being undertaken on the basis set out in Part B of this document

3 Indicative EOI Programme

The following is an indicative EOI programme that Kaipara District Council presently intends to follow. Kaipara District Council may modify the steps and/or dates at any time at its discretion including terminating the process.

Note that time has been allowed for participants to meet with Council staff and view the existing operation.

EOI Programme

Activity	Date(s)
Advertised via Tender Link Expression of Interest (EOI)	2 Oct 2013
Meet with EOI participants for briefing , site visit and clarification of any questions (if requested)	11 Oct 2013
Closing date for submission of EOI	24 Oct 2013
Evaluation period concludes	7 Nov 2013
Participants advised of outcome	8 Nov 2013

Part B

Expression of Interest Requirements

Part B – Expression of Interest Requirements

4 Value For Money

The purpose of this Expression of Interest (EOI) process is to identify viable options that will deliver best value to the Kaipara District Council in the long term and to understand what potential providers or partners are able to support Council in achieving its objectives.

5 Acknowledgement

The participant is required to acknowledge receipt of this EOI and to agree to the basis upon which the EOI process is being undertaken by completing the acknowledgement form attached as schedule 4, Part C to this EOI, and returning it to the address set out on the form by 4.00pm 24 October 2013. The participant will advise on the acknowledgement form the name and address of the person(s) authorised to communicate with Kaipara District Council on behalf of the participant in relation to this EOI. The participant acknowledges that Kaipara District Council shall not be obliged to deal with any person(s) other than the person(s) so authorised.

Participant To Inform Themselves Fully

Every EOI submission must be made on the basis that the participant acknowledges that:

- a. This EOI does not and does not purport to, contain all the information that participants may need in making decisions about or relating to its EOI submission;
- b. Kaipara District Council is not responsible for any costs or expenses incurred by the participant or any other person in responding to or taking any other action in relation to this EOI.

The information provided in this EOI and the requirements and obligations detailed in the services are based on assumptions made by Kaipara District Council about future wastewater disposal requirements, which may or may not prove correct in practice. Future wastewater disposal requirements may vary significantly from current and historical requirements. The participant must make, and base, any EOI submission entirely on its own independent assessment of future wastewater disposal requirements and opportunities.

Any information whatsoever provided by Kaipara District Council to participants has been provided to assist participants in preparing the EOI submission, and Kaipara District Council does not represent or warrant the completeness or accuracy of such information.

6 Communications, Additional Information and Clarifications

All communications as to this EOI, or requests for clarifications or further information should be directed to the EOI Administrator who is Kaipara District Council's authorised representative.

The EOI Administrator contract details are as follows:

Brian Armstrong
 Water Services Operation Engineer
 Kaipara District Council
 Private Bag 1001
Dargaville 0340

Telephone (09) 439 3123 Fax (09) 439 6756 Email: barmstrong@kaipara.govt.nz

- Requests for clarification or additional information or for interviews with Kaipara District Council staff must be made in writing and submitted to the EOI Administrator
- No other Kaipara District Council employee, contractor or Kaipara District Council elected representative may be contracted concerning any aspect of this EOI process without the prior express written permission of the EOI Administrator
- Unless expressly advised otherwise, no person other than the EOI Administrator has any authority to provide information to participants or answer questions in relation to the EOI process
- Any instruction or information resulting from enquires by the participants may, at Kaipara District Council's absolute discretion, be issued in writing to all participants in the form of an explanatory notice which will then become part of the EOI documents
- During the evaluation period, Kaipara District Council may request meetings with participants to clarify any point of their EOI submission or require further information
- Whether any such meeting is called is at the sole discretion of Kaipara District Council
- Participants agree not to raise any claims or allegations against Kaipara District Council that they have been disadvantaged by any lack of information provided to them, or any ambiguities in information provided to them as part of this EOI process
- The information furnished in the EOI submission and during any interviews (if any) will be used in assessing the participants suitability to participate in any subsequent process (if any is undertaken following the EOI process)
- Notwithstanding any other requirements of this EOI, Kaipara District Council may require the participant to submit additional information to allow further clarification of the participants EOI submission
- Should the participant fail to submit any of the information so required by the date and time stipulated by Kaipara District Council, the EOI submission may be rejected, without consideration or considered and rejected due to lateness.

7 Form of EOI Submission

Whilst the detailed structure of the EOI submission is not mandated, participants should submit their EOI submission as follows:

General

- Participants should use easy to read structure, fonts and formatting that assist the evaluators to align submissions to the EOI objectives and evaluation criteria
- Participants should take time to understand how they can assist Kaipara District Council meet its objectives for this procurement and recommends effective use of an executive summary to illustrate their alignment to these objectives
- Participants should include an attributes summary section demonstrating how their proposal aligns to the evaluation criteria.

Specific requirements:

- Contents page – maximum one A4 page
- Executive summary – maximum three A4 pages
- Company background and relevant experience – maximum three A4 pages plus appendices(if required)
- Options and recommendations – there is no limit to this section however Kaipara District Council expects this section to be no more than ten A4 pages
- Alignment to evaluation criteria – maximum three A4 pages
- Participants must address the evaluation attributes described in Part B, clause 9 of this EOI.
- Participants must complete and return the acknowledgement and statement of departures
- EOI submissions may be submitted jointly by two or more organisations. Kaipara District Council would prefer that one member of any consortia be nominated as the lead provider
- The EOI submission must be signed by an authorised signatory or signatories, where there is more than one participant, of the participant
- The EOI submission must be signed by an authorised signatory of the participant.

8 Submission of EOI Submissions

EOI submissions will be accepted up until the closing date. EOI submissions must be submitted by delivery to Kaipara District Council.

The address for delivery is:

Kaipara District Council
42 Hokianga Road
Dargaville 0310

There will not be a public opening of EOI submissions.

All EOI submissions received by Kaipara District Council, including any subsequent clarification, will be retained (and may be subsequently destroyed) by Kaipara District Council.

Participants must submit an original and one identical bound copy of any EOI submission in hard copy (paper) format. Participants must also submit a PDF electronic version of a size and format suitable for email.

EOI submissions must be enclosed in a sealed envelope endorsed with the following:

- Expression of Interest for Mangawhai Community Wastewater Scheme Disposal Options Study
- Kaipara District Council
- Closing Date: 24 October 2013 4pm
- Participants name, contact person details and address for communications
- EOI submissions sent by e-mail or facsimile may not be accepted.

9 Evaluation Methods and Attributes

Evaluation methods

EOI submissions will be evaluated using the weighted attributes method.

Evaluation criteria

Kaipara District Council's nominated Evaluation Team will examine each EOI submission in accordance with (but not limited to) the following attributes:

Attribute	Weighting
Relevant Experience	10%
Relevant Skills	10%
Methodology	10%
Resources	5%
Compliance with Employers Requirement	5%
Price	60%

Participants must ensure that all information that they wish to have considered is included in their EOI submission.

10 Late Proposals

- Kaipara District Council reserves the right to consider late EOI submissions
- Any EOI submission lodged after the closing date will be taken to be late
- If an EOI submission is taken to be late, Kaipara District Council may, in its absolute discretion, invite

- the participant to provide it with explanatory evidence as to the reasons for the delay
- The decision to consider a late EOI submission or exclude it from consideration will generally be based on the circumstances surrounding the submission and the receipt of the late EOI submission
 - An important issue for Kaipara District Council in this regard will be whether the participant is likely to have had an opportunity to obtain some unfair advantage from late submission.

11 Freedom of Information

Participants will be aware that the Local Government Official Information and Meetings Act 1987 gives members of the public rights to access official documents of Kaipara District Council. If a participant wishes to withhold any information provided as part of its EOI submission from the public it should clearly identify the areas not to be disclosed and identify the reasons for the withholding this information in terms of the Local Government Official Information and Meetings Act 1987.

12 Disclosure of Certain Information

Notwithstanding the above, the following information will be made publicly available:

- a) The names of the participants
- b) Description of the services the participants are proposing to provide
- c) Details of the EOI process, and any changes to the process.

13 Important Notices and Basis of Participation

This EOI is issued by Kaipara District Council.

This EOI is not an offer to enter into a contract.

The dates given are indicative dates only and it may be necessary to change these from time to time to ensure a fair and robust process. Kaipara District Council will endeavour to keep the participants advised of any changes as promptly as possible.

Kaipara District Council reserves the right to:

- Change the EOI process (including proposed evaluation methodology) at any time
- Terminate the EOI process at any time
- Not progress this EOI process through to the negotiation of supplier contracts
- Waive any irregularities of informalities in the EOI process, or in a EOI submission
- Amend this EOI , or any associated documents
- Accept or reject any EOI submission including tagged, non – conforming or alternative EOI submissions, and select any participant or other party (whether or not that party was involved in this EOI process) to proceed to the next phase, at its discretion.

The participant expressly agrees that:

- It did not use the improper assistance of Kaipara District Council employee's or ex employees, or

information unlawfully obtained from Kaipara District Council in compiling its EOI submission

- Any potential conflicts of interest have fully disclosed in the EOI submission
- It is responsible for all costs and expenses arising from or related to the preparation and lodgement of its EOI submission , any subsequent negotiation and other action or response in relation to this EOI
- No legal or other obligations shall arise between the participant and Kaipara District Council in relation to the conduct or outcome of the EOI process. It shall not have any rights against Kaipara District Council of any nature whatsoever arising from the EOI process and that accordingly, it shall not make any claim of any nature against Kaipara District Council (or any person associated with Kaipara District Council) any costs incurred in the EOI process or in respect of any lost expectation of profits
- Following the EOI process Kaipara District Council may issue a Request for Proposal (RFP) for its preferred options, enter into negotiations with a preferred participant or participants or conclude this EOI process without any further action
- No public announcements or statements to the media or disclosure of any information received as a consequence of, or relating to the EOI process, may be made without the prior written consent of Kaipara District Council.

MANGAWHAI COMMUNITY WASTEWATER SCHEME

RECLAIMED WATER DISPOSAL STUDY

INFORMATION PACK

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1. BACKGROUND

The Mangawhai Community Wastewater Scheme (MCWS) currently disposes of the treated effluent by spray irrigation onto a council owned farm at Brown Road Mangawhai. Currently approximately 30 ha is under irrigation. With increasing numbers of connected properties the current irrigated area is insufficient to dispose of all the treated effluent in a typical year. Before proceeding to increase the irrigated area council has decided to review the options for water disposal to determine if there are more cost effective options for disposal of all or a proportion of the effluent. Council also recognises that in the medium term the farm simply does not have sufficient irrigable area to handle all the effluent and therefore desires to establish a long term strategy that takes account of this. Council therefore invites expressions of interest from consulting firms to conduct a study to review options for disposal.

The collection system, treatment plant and irrigation system operate under a resource consent granted by Northland Regional Council (NRC)¹.

The MCWS is operated by Water Infrastructure Group under a contract with the council while a local farmer has a grazing licence and is responsible for general farm maintenance.

2. SCHEME DESCRIPTION

Mangawhai is a beachside community with perhaps 20 – 25% of the houses permanently occupied. Peak load occurs at New Year and is of relatively short duration. Sewage is collected via a mix of grinder pumps and gravity sewers and is delivered to the treatment plant located in Mangawhai Park via a network of pump stations. There are no significant industrial wastes.

Treatment is by preliminary screening < 6mm followed by an activated sludge stage using a proprietary CASS continuous feed sequencing batch reactor. Effluent from the CASS reactor is filtered in pressure filters using a ground glass filter media followed by disinfection with sodium hypochlorite solution prior to storage in the final effluent tank and transfer to the farm.

From the plant reclaimed water is pumped some 10 km to the Lincoln Downs farm where it is stored in a large earth dam capable of holding 170 ML constructed for the purpose. The irrigation system draws water from this dam.

Reclaimed water is pumped from the dam and applied using fixed sprinklers post mounted at approximately 25m centres. The sprinklers are organised into zones of between 15 and 30 sprinklers. (Some of the smaller zones have been paired up to increase application rates.) Irrigation is controlled by a dedicated PLC. Schedules can be set up either on a touch panel at the farm or via an internet connection. Details of the irrigation system are available in supplier manuals.

The system is designed to use deficit irrigation as described in the Environmental Management Plan – Lincoln Downs April 2010. Details of operation in the 2011/12 year are contained in the report on operation prepared for NRC. (These documents will be made available to the successful consultant.) Council has discussed with NRC a change to the consent allowing irrigation to saturation as per the letter attached in Appendix 2. This change is expected to allow an increase in the amount applied per hectare; the consultant is required to evaluate the effect of this change as part of this study.

At present approximately 30 ha is irrigated; 24 ha installed under the initial contract and an additional 6 ha installed in 2012 which are “piggy backed” onto zones 15 to 18. (These “A” zones are manually switched over and any future work at the farm should include linking them into the control system.)

¹ Resource consent CON 20121496901

3. RECLAIMED WATER QUALITY

The treatment plant operator is required to deliver reclaimed water meeting the standards set out in the resource consent namely:

At the treatment plant (after disinfection):

Parameter	Units	Performance Requirements		
		Median	Average	90 th %ile
E. coli	MPN	10		100
Total Dissolved Solids	Mg/l		500	
Total Nitrogen	Mg/l		30	
Phosphorus	Mg/l		15	
Total Suspended Solids	Mg/l		10	
Carbonaceous Biochemical Oxygen Demand	Mg/l		10	

Irrigation water (ex dam)

Parameter	Units	Trigger Level	Maximum
E. coli	MPN	1000	10,000

Typical plant output composition is as follows (average for 24 months 2011-2013)

TM	Units	Typical composition
Total Dissolved Solids	Mg/l	380
Total Nitrogen	Mg/l	13.5
Phosphorus	Mg/l	8.2
Total Suspended Solids	Mg/l	3.5
Carbonaceous Biochemical Oxygen Demand	Mg/l	3

The treatment standard at exit from the plant, on which the design was based, is California code 22 for disinfected secondary – 23 recycled water. This standard is accepted by Fonterra for application to pasture which is fed to lactating cows as per Article 3 section 6304 of the code. (Because of contamination in the dam the irrigation water has higher total coliform levels than permitted under this code.) Fonterra have confirmed that irrigation must cease for 30 days before grazing or making silage intended for feeding lactating cows. Presently dry cows are being grazed on the irrigated blocks.

4. RECLAIMED WATER VOLUMES

Records are kept of effluent volumes received daily at the plant. Monthly intake is summarised in the spreadsheet *Irrigation study April 2013.pdf* (Excel versions will be supplied to the selected consultant.) There is considerable variation in monthly data due to weather; With virtually all houses on tank supply the drought this year has seen a 25% drop in daily inflows for February and March.

This spreadsheet also details expected increases in inflow over the next 10 years and a typical irrigation water balance based on the existing 30ha irrigated area.

5. STUDY PARAMETERS

A study² undertaken before the scheme was constructed considered a number of options before recommending the irrigation to farm land scheme now installed. Because at that time the objective was to provide a system to handle the total output of the treatment plant options that would use part of the output only were discounted. This is no longer the case and opportunities to use a part of the effluent can now be considered.

The irrigation balance referred to above shows that over the next 10 years it will be necessary to provide additional facilities to handle up to 100,000 cum per year and that towards the end of the period Lincoln Downs on its own will be insufficient even if the irrigated area is expanded.. At present cash flow from the irrigated areas is negative so there is no problem with diverting water that would otherwise be applied at Lincoln Downs to other users.

While previous studies and information on the system (see list in Appendix 4) will be made available to the successful consultant the primary aim of this study is to take a fresh look at the options for handling reclaimed water in excess of the capacity of the current irrigated area. In particular the following options shall be considered together with any other options suggested by the consultant.

1. Mangawhai Golf Course
2. Te Arai Golf Course and Subdivision
3. Mangawhai Park
4. Other land based options
5. Other alternatives including discharges to water

Council has had preliminary discussions with the Te Arai developer and Mangawhai golf club; notes of the discussions with Te Aria are included in Appendix 1.

6. STUDY OUTPUTS

1. A report describing the options considered, initial and ultimate capacity of these, capital cost estimates (assuming development is staged to match increasing inflows), risks (both physical and regulatory) capital and operating costs (summarised as a NPV calculation) leading to a ranking of the options.
2. Note that it is not required to repeat information included in previous studies – this can be included by reference.
3. Where to from here? A summary of the steps required to advance the recommended scheme to the stage where regulatory approval is achieved and construction tenders can be called.
4. Recommendations.

² Earth Tech May 2006

7.SUBMISSIONS

Proposals will be evaluated on the basis of:

Qualifications of the consultant.

- experience in similar projects
- expertise of assigned staff

Approach and methodology

- understanding of the context, requirements and objectives of study
- methodology
- innovation
- presentation of proposal.

Submissions shall include:

1. A written statement describing the consultants proposed approach and methodology.
2. A listing of deliverables to be provided under the consultancy contract.
3. Staff proposed for the study, with brief CV's and a description of their roles in the overall project team.
4. Hourly rates and an estimate or proposed time allocation required to complete the study.

It is intended that submitters will be evaluated by the Principal against the requirements set out in this expression of interest scoping document. However, the Principal reserves the right to depart from such requirements at its sole and absolute discretion.

An evaluation panel of a minimum of two persons and any advisors as required by the Principal will evaluate the expression of interest submissions in accordance with the tender evaluation process. The tenders will be evaluated on the basis of price and assessment of the non price attribute information submitted by each Tenderer.

APPENDIX 1

Notes from meeting between KDC and Darby Partners re Te Arai golf course irrigation

Hi John

Thanks for meeting with Peter and I recently.

As discussed Te Arai Coastal Lands (TACL) are interested in proceeding further with the potential use of the treated wastewater from Mangawhai wastewater scheme for Irrigation on the coastal land north of Te Arai Point.

There are several potential uses on the site and these include Golf Course Irrigation, Irrigation of native re-vegetation areas and irrigation of forestry. The Golf Course has potential to use between 500 and 1000m³ per day during the irrigation season (100 days). A similar quantity could be utilised in re-vegetation and or forestry areas but this obviously depends on the area allocation for irrigation and the application rates.

It may be possible to incorporate a combination of options so that the Golf Course has water available when required but if not there are alternative disposal sites that can be used.

As you are aware the site is on sand soils and parts of the site are elevated on older dune formations so there is potential for quite high hydraulic loading rates to be used (although obviously other environmental effects would need to be considered.

Potential pipeline routes that we think are feasible are running along black swamp road and then cutting across the farmland near to the AC / NRC Boundary or running into the site along the main access Pacific Road.

We would be happy to provide further details and undertake further feasibility work but would probably need an understanding of volumes of wastewater that would make the proposition viable from your perspective.

If you need further information or wish to discuss further please don't hesitate to let me know.

Regards

Marcus
Marcus Bird · Darby Partners

APPENDIX 2

Proposed Changes to Resource Consent

Colin Dall

Consents/Monitoring Programme Manager

Northland Regional Council

Dear Colin,

Introduction

This purpose of this letter is to outline a proposed trial change to irrigation scheduling that Kaipara District Council (KDC) intends to undertake at the Mangawhai Wastewater Treatment Scheme site and to seek Northland Regional Council's (NRC) agreement on the trial before proceeding.

Whilst this letter does not seek to alter any existing resource consent conditions for resource consents CON20051496901 (01, 03-08), KDC wishes to advise of a minor change to the Environmental Management Plan (EMP) required under Condition 39 of the existing consent and the potential that Condition 8 may be exceeded that 'limits the rate of application to no more than 5,000 cubic metres per hectare between 1 July and 30 June'.

Purpose of Seeking Change to Environmental Management Plan

Irrigation at the Lincoln Downs farm is currently based on deficit irrigation as described in the EMP and associated irrigation scheduling tool. KDC are seeking to investigate the potential to increase treated wastewater irrigation rates above the current limits to saturation. Irrigation to saturation has potential benefits as increasing the rate of treated wastewater applied to land will potentially defer the need to extent the irrigated area.

Current Environmental Management Plan Approach

The existing EMP provides details of a deficit irrigation scheme based on maintaining a deficit of between 10 and 20 mm after irrigation (scheduling tool Figure 3.1 of EMP April 2010). Based on the existing approach irrigation is run on weekly cycles with the soil allowed to dry for several days and is then irrigated again to bring the soil back up to a deficit of between 10 and 20 mm and the cycle repeated.

To allow grass to be removed it is necessary to allow paddocks to dry out further (typically three times a season) to allow grass to be harvested either by feeding livestock in the paddocks or cutting and removing as feed. Substantial water is then required to bring soil moisture back up to around a 10 mm deficit in the period following cutting.

Proposed Change to Environmental Management Plan Approach

It is proposed to trial a modification to the EMP that will allow moisture levels to be maintained closer to saturation and to operate by applying water several times a day (whilst the irrigation is operated) with a typical maximum of around 3 mm per cycle.

This will have the potential positive effect of increasing evaporation off the plant surfaces compared to the existing irrigation regime.

There is the potential for runoff to occur outside the irrigation zones into the buffer areas should the irrigation not be managed appropriately. Condition 9 of the existing consent states that:

"Notwithstanding Condition 8, the instantaneous irrigation rate shall not result in any overland flow of treated effluent beyond the irrigation area into any buffer area, as defined by Condition 7"

KDC currently monitors compliance with this Condition 8 by a number of means including regular visual observations and spade testing to determine soil moisture levels (observations and results are noted in a farm log book which also provides details of water applied in each of the log zones).

With the above approach of irrigating close to saturation, it may be possible that the maximum annual application rate of 5,000 cubic metres per day may be exceeded. This annual application will continue to be monitored and reported as required by Schedule 4.

Given the above proposed change, the irrigation scheduling procedure outlined in Table 3.4 is proposed to be modified as follows:

1. Estimate soil moisture content of the soil using visual methods (i.e. the spade test);
2. Set application rates for groups of zones based on observation of soil moisture levels;
3. Monitor irrigation to ensure there is no runoff into the buffer zones;
4. Cease irrigation when daily rainfall is greater than 5 mm;
5. Resume irrigation after rain based on the result of the spade tests; and
6. Irrigation will continue in winter if the above criteria are satisfied.

In determining the irrigation scheduling procedure, it is proposed to utilise the above method rather than irrigation rates being determined primarily by the annual application rate.

Management of Irrigation

It is proposed that the management roles are changed from the current arrangement to transfer greater responsibility for day to day operation to the Water Infrastructure Group (WIG). WIG will become responsible for setting up irrigation schedules and carrying out regular soil moisture tests and monitoring system operation.

Summary

KDC are seeking NRC's approval of the proposed change to the irrigation scheduling as outlined in this letter and seek approval in writing prior to commencing the trial.

Please contact John Burt at Kaipara District Council should you wish to discuss these matters further.

Kind regards,

APPENDIX 3

Reports and files provided with this RFP.

File – reclaimed water study april 2013.pdf

APPENDIX 4

Additional reports and files available to the successful consultant.

Irrigation application data 2011-12 and 2012-13 years. (Daily volume applied per zone and rainfall) .xls file.

Mangawhai Treated Wastewater Disposal – Assessment of Land Disposal Options. URS March 2006.

Disposal Options Report May 2006 Earth Tech Ltd.

Mangawhai Golf Course Site Investigation – URS August 2006

Environmental Management Plan – Lincoln Downs Farm –RMG 2009

Details of farm irrigation as installed.

Resource consent CON 20121496901

APPENDIX 2

WASTEWATER AND EFFLUENT QUALITY ANALYSES

WASTEWATER AND EFFLUENT QUALITY ANALYSES

Table A2-1, 2 & 3 show the statistical data for the WWTP influent, effluent and for the Lagoon effluent. Note that the bacteriological quality of the lagoon effluent is significantly worse than for the WWTP effluent. This is due to prolonged storage in an open lagoon, and atmospheric pollution from birds, leaves and algae.

TABLE A2-1: Mangawhai Influent Characteristics

	TSS	BOD5	TOTAL P	TOTAL N	NH3-N	NO3-N	COD
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Minimum	175	72	0.0	34	13.0	-	228
10% Percentile	245	166	9.6	58	46.2	0.0	506
Average	377	296	13.6	81	70.7	1.2	749
Median	348	266	12.0	81	71.0	0.4	690
90% Percentile	567	455	17.0	102	95.3	1.1	1,034
Maximum	793	720	57.8	135	132.2	20.3	1,254

The influent wastewater is relatively typical of a community like Mangawhai, slightly stronger than typical wastewater from a large city, due to slightly lower water use.

Table A2-2 shows the statistical Data for the WWTP effluent. The WWTP is producing a relatively high quality tertiary treated effluent.

TABLE A2-2: Mangawhai Effluent Characteristics

	TDS	TSS	TN	TP	CBOD	TRANSMISSIVITY	pH
	mg/L	mg/L	mg/L	mg/L	mg/L	%	-
Minimum	221	1.0	1.0	2.9	0.0	25%	6.2
10% Percentile	328	1.0	5.6	4.9	1.3	40%	6.5
Average	390	3.4	13.6	8.9	3.1	47%	6.8
Median	375	2.4	14.0	8.2	3.0	47%	6.8
90% Percentile	469	7.0	21.6	13.4	6.0	52%	7.0
Maximum	615	16.0	42.0	38.7	11.0	59%	7.4

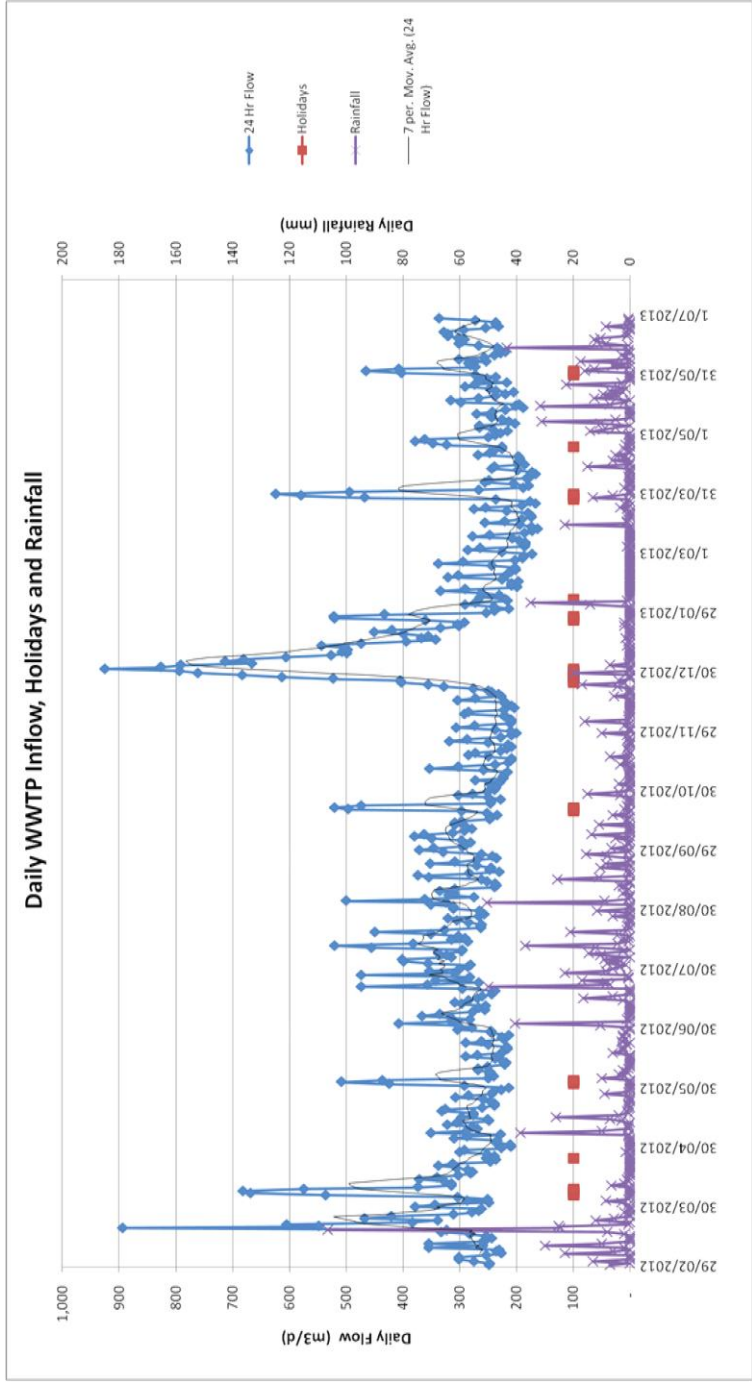
Table A2-3 shows the statistical bacteriological quality data for the WWTP effluent and for the Lagoon effluent.

TABLE A2-3: Mangawhai Effluent Bacteriological Quality

	WWTP FINAL EFFLUENT RESULTS			EFFLUENT LAGOON RESULTS	
	E COLI POINT A/ B	MEDIAN (OVER 12 SAMPLES)	90 PERCENTILE (OVER 12 SAMPLES)	E-COLI	T-COLI
	MPN/100	MPN/100	MPN/100	MPN/100	MPN/100
Number of Samples	256	286	70	16	16
Minimum	1	1	1	1	24
10% Percentile	1			10	51
Average	12	1	3	619	1494
Median	1	1	1	173	894
90% Percentile	4			2000	4106
Maximum	1733	10	15	3654	4611

The graph on the following page shows the WWTP influent flow and the rainfall and holidays. Generally, peaks in the wastewater flow are seen following heavy rain or holiday times.

Daily WWTP Inflow, Holidays and Rainfall



APPENDIX 3

PRELIMINARY MASS BALANCE MODELLING FOR MANGAWHAI EFFLUENT IRRIGATION OPTIONS

Completed by BMT WBM Pty Ltd, June 2014

Our Ref: BAA: L.N20190.001.PreliminaryAdvice

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19 June 2014

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www.bmtwbm.com.auGrant Pedersen
Senior Associate
Harrison Grierson
PO Box 5760,
Wellesley Street
Auckland 1141

Dear Grant

RE: PRELIMINARY MASS BALANCE MODELLING FOR MANGAWHAI EFFLUENT IRRIGATION OPTIONS

1 Introduction

The following document summarises the outcomes of an evaluation of existing and potential future approaches to effluent irrigation as part of the Mangawhai Wastewater Scheme. BMT WBM have been engaged by Harrison Grierson to provide high level advice and preliminary water and nutrient balance modelling services that will assist in determining an improved and effective long-term effluent management strategy.

It is understood the existing Lincoln Downs irrigation scheme involves surface spray irrigation over 25 hectares of largely unmanaged pasture that is cut to waste periodically. A deficit irrigation schedule is typically adopted where possible. During or following prolonged wet periods treated effluent is irrigated at higher rates in a practice referred to as 'runoff irrigation' to avoid uncontrolled overflow of the 170 ML storage dam.

Consideration has been given to a range of options for further irrigation of effluent based on discussions with Harrison Grierson and review of available previous reports. The modelling undertaken is readily able to be applied to a range of irrigation and land use options during initial option development and planning. Should options incorporating effluent irrigation be taken forward for more detailed assessment, BMT WBM recommend more comprehensive and option specific modelling be undertaken to evaluate feasibility and performance.

2 Review of Background Material

The following reports, information and data were reviewed as part of this assessment.

- Effluent quantity and quality data for Mangawhai STP and irrigation flow rates for Lincoln Downs Farm.
- Soil laboratory data and published soil landscape information for the site.
- Climate data from the NIWA database from nearby stations.
- Northland Regional Council Resource Consent for discharge of treated effluent to land.
- URS (2006) *Mangawhai Treated Wastewater Disposal – Assessment of Land Disposal Options*.

- Tonkin and Taylor (2006) *Mangawhai Ecocare Project Hydrogeological Investigation – Water Reuse Area*.
- Earthtech (2006) *Assessment of Treatment and Disposal Options*.
- RMCG (2010) *Environmental Management Plan – Lincoln Downs Amended Final Report*.
- WaterForce (2009) *Eco-Care Irrigation Scheme Operators Manual – Stage 1 Works*.
- WaterForce (2009) As built drawing of Lincoln Downs.

The following initial observations and advice is provided.

- Details of any water balance modelling completed as part of the design and consent of the scheme are not provided and only briefly alluded to in reports. The assumptions surrounding the irrigation capacity of pasture, woodlot and golf course are difficult to validate but appear optimistic in the current context.
- Based on effluent nutrient concentrations and application rates, historical nitrogen loading to the pasture is low compared to demand from a productive pasture. It is possible that water uptake of pasture could be improved through further provision of nitrogen.
- The typical irrigation demands for pasture in the region (quoted in the EMP) of 4 (range of 3-5) ML/ha/year are representative of an actively managed pasture being grown for profit through the optimisation of growing conditions (including plant available water, nutrients) and less emphasis on maximising opportunities for irrigation or limiting impacts on receiving waters. This is not reflective of the current operation of Lincoln Downs but may be an option (subject to local advice on fodder production).
- Existing qualitative, visual checks of near surface soil moisture cannot be expected to maximise opportunities for irrigation. Monitoring of soil moisture content at key locations and depths is recommended and does not have to be used as the sole determinant for irrigation scheduling.
- “Disposal” (separation of deficit irrigation from options that “over-irrigate” in terms of environmental risk is debatable based on my experience) focused options originally considered and eventually adopted have primarily been about applying significant volumes of effluent onto the site or into rapid infiltration basins/trenches during winter periods as a last resort. Often this is done to maximise opportunities for beneficial reuse by the crop.

However, in the climate observed at Mangawhai such an approach is very high risk. There are land treatment options available that can readily be argued to pose a comparable risk to receiving environments as a deficit irrigation approach. Importantly, potential impacts are much lower than options that involve the point discharge of effluent off-site. I have discussed one option below.

- In reading the letter from Fonterra on their human effluent policy it would appear to me that pasture irrigated with effluent that *does* meet Californian Standard Title 22 can be fed to lactating animals. Where it does not meet Title 22, fodder is not meant to be fed to cows within 30 days of lactation? This would suggest that if Title 22 could be achieved, fodder could definitely be fed to dairy cows and perhaps for part of the year even if it is not met?

3 Preliminary Land Application Options Evaluated

As a starting point, the following options have been evaluated.

3.1 Expanded deficit irrigation with excess managed off site

Expanding the deficit irrigation capacity of the existing Lincoln Downs Farm to 60-65 ha with excess to be managed off-site (via irrigation of Mangawhai Golf Course or other land or discharge to water).

Involves maintenance of the existing irrigation and pasture management approach which limits the volume of effluent required for irrigation to some degree. Assumption is that the number of zones would be increases as per the existing WaterForce design and irrigation main alignment up to 60-65ha.

We have then provided a land area required to manage the excess effluent (via deficit irrigation) assuming no additional storage via golf course or public open space irrigation. The excess effluent is also presented as a volume for consideration of discharge to water options (i.e. this represents the “winter” discharge).

3.2 Maximised deficit irrigation within Lincoln Downs farm

Involves maximising the deficit irrigation capacity of Lincoln Downs through improved pasture/fodder production (or potential woodlot). Involves active improvement in the productivity of pasture or fodder grown at Lincoln Downs. Likely to involve ryegrass, fescue or lucerne (or a combination of those) along with additional nitrogen application. This may be through reduction of the nitrogen reduction at the STP and/or fertiliser application. Local agronomic advice would be required to provide guidance on optimising growing conditions to achieve a water demand comparable to other producers (3-5 ML/ha/yr). The MEDLI model predicted average water usage of 4 – 4.2 ML/ha/year based on a deeper rootzone and more productive (~10t/ha/yr DM yield) ryegrass or lucerne crop.

3.3 Partial deficit irrigation with slow rate land treatment of excess

Involves partial reuse (deficit irrigation) with slow rate land treatment of excess effluent within the Lincoln Downs Farm. Consideration could be given to maintenance of 25-35 ha of deficit spray irrigation at Lincoln Downs supplemented by addition subsurface irrigation operated in a slow rate land treatment configuration. This involves the application of highly pre-treated (existing effluent quality is fine) effluent pulse dosed at ~1.5mm/day (typically in 4 dosing events ~0.4 mm/day) rain/hail/shine over the entire year. There is plenty of flexibility in drier years to deficit irrigate but this would allow dam levels to be kept lower in wet years without the need for runoff irrigation events.

This type of approach does not cause runoff but does increase deep drainage to groundwater or interflow to surface drainage features (depending on hydrogeology). However, the effluent undergoes significantly more treatment as it moves slowly through the subsurface. Design of such systems focuses on assigning hydraulic loading rates that will not cause significant or prolonged waterlogging of the soil or significantly alter the hydrology of receiving environments. Nutrient loads are typically within or close to the low growth crop uptake rates of ryegrass and other pastures.

In terms of using this information to consider additional land areas for irrigation, there are really only two irrigation capacities (in ML/ha/yr) that need to be considered for planning purposes. These are discussed below.

We have assumed that no further storage dams would be built as the existing dam is already substantial and increases only make management more difficult due to the net water surplus in the region.

4 Important Assumptions for Mass Balance Modelling

- Yet to incorporate daily variation in effluent inflows to dam (takes a little while to build into MEDLI being such an old program). Will test this as part of any future modelling.
- Have currently assumed dam has no upslope catchment (it appears there is a small catchment).
- We have adopted a “happy medium” irrigation schedule that ceases irrigation when soil moisture is 8mm below field capacity (as a medium between the 5-10mm deficit quoted in the EMP). This is pushing the boundaries of deficit irrigation but is unlikely to be a concern for this site.
- Current assumptions around capacity of the irrigation system are based on available irrigation records (0.5 – 12 mm/day applications possible).
- Have had to assume P sorption capacity parameters for the soils.
- Have not incorporated hydraulic restrictions associated with groundwater mounding (for alluvial sections) or horizontal drainage (in the hilly zones) at this stage.
- MEDLI modelling implicitly assumes almost 100% efficiency in irrigation (i.e. highly accurate soil moisture data and the ability to irrigate small depths over all zones in a single day).
- It is not possible to achieve 100% reuse (i.e. 0% overflow from the dam) from a deficit irrigation scheme in this climate. It is almost impossible in all but arid environments. In the absence of clear guidelines we have adopted a maximum number of overflows of 3 in 30 years (i.e. 10% of years). This typically achieves 95%+ beneficial reuse in a volumetric sense.

5 Summary of Preliminary Results for Planning

Preliminary modelling results are summarised in the following tables for each of the 3 options summarised above. The additional land listed in Table 1 could be used for irrigation of the Golf Course, public open space or typical mixed pasture (unproductive).

Table 1 Preliminary Results for Option 1 (Expanded Deficit Irrigation, excess managed off site)

Scenarios that require testing	ADWF (kL/day)	Storage (ML)	Irrigation	Crop	Lincoln Downs (Ha)	Additional ha	Add Vol. ML/yr	% Total ADWF Reused*
Existing Farm under existing ADWF	300	170	Fixed sprays	Existing mixed pasture	55	0		
Existing Farm under Interim Growth 1 ADWF	375			Existing mixed pasture	65	5	5	98%
Existing Farm under Interim Growth 2 ADWF	450			Existing mixed pasture	65	20	26	89%
Existing Farm under Interim Growth 3 ADWF	600			Existing mixed pasture	65	60	77	67%
Existing Farm under Ultimate ADWF	640			Existing mixed pasture	65	80	93	60%

* Based on options involving "winter" discharge to water of excess effluent.

Table 2 - Preliminary Results for Option 2 (Maximised Deficit Irrigation within Lincoln Downs Farm)

Scenarios that require testing	ADWF (kL/day)	Storage (ML)	Irrigation	Crop	Prelim ha	Add ha	Add Vol ML/yr
Existing Farm under existing ADWF	300	170	Fixed Sprays	High performance pasture	30	0	0
Existing Farm under Interim Growth 1 ADWF	375			High performance pasture	36	0	0
Existing Farm under Interim Growth 2 ADWF	450			High performance pasture	43	0	0
Existing Farm under Interim Growth 3 ADWF	600			High performance pasture	62*	0	0
Existing Farm under Ultimate ADWF	640			High performance pasture	65*	0	0

* TBC if more than 60ha of suitable land is available. Recommend a proper Land Capability Assessment (LCA) be undertaken.

Table 3 – Preliminary Results for Option 3 (Partial Reuse by Deficit Irrigation with Slow Rate Land Treatment via Subsurface Irrigation of Excess within Lincoln Downs Farm)

Land Treatment Scenarios	ADWF (kL/day)	Storage (ML)	Irrigation	Crop	Deficit ha	LTS* ha
Existing Farm under existing ADWF	300	170	Deficit - Fixed Spray LTS - SSI	Existing mixed pasture	25	11
Existing Farm under Interim Growth 1 ADWF	375				25	16
Existing Farm under Interim Growth 2 ADWF	450				35	16
Existing Farm under Interim Growth 3 ADWF	600				35	27
Existing Farm under Ultimate ADWF	640				35	29

* Assumed Design Loading Rate (DLR) of 1.5 mm/day

6 Preliminary Discussion and Outcomes

If land application options have potential to achieve the objectives of KDC, a more detailed modelling framework can be developed that should be supported by some more targeted field data on soils, crop performance and local hydrology.

We have recently completed a significant amount of work gaining regulatory acceptance of the slow rate land treatment by subsurface irrigation approach here in NSW on behalf of Sydney Water. This included field investigations, modelling, concept development and extensive peer review. I'm sure we could use that as an initial justification for further consideration by NRC if this option appears to have merit.

Under a deficit scenario, the key question relates to the ability to cost effectively establish and maintain a more productive pasture that would enable a significant increase in annual irrigation volumes on Lincoln Downs. In the current operational mode, the site is being significantly over irrigated and this can be observed in the irrigation records. As such, if deficit irrigation is to be continued with a largely unmanaged pasture, the full 60ha of irrigation will be needed soon with additional land or discharge to water likely to be essential somewhere between 2024 – 2035.

If you wish to discuss this further please don't hesitate to contact the undersigned on +61 2 4940 8882 or ben.asquith@bmtwbm.com.au.

Yours Faithfully
BMT WBM



Ben Asquith

APPENDIX 4

FONTERRA EFFLUENT POLICY

08 March 2013

To Whom It May Concern

Fonterra has reviewed its policy relating to the use of human effluent wastewater and sludge on pasture or feed that is fed to dairy cows supplying Fonterra.

Fonterra's previous policy allowed for the application of wastewater treated to the Californian Standard Title 22 to be applied to pasture being grazed by lactating cows. Any wastewater not meeting this standard was to be sub-surface irrigated.

Additionally, stabilised sewage sludge could be incorporated in to the soil, a crop grown, harvested and fed to lactating cows, and then the pasture could be re-sown and fed to lactating cows.

Taking in to account feedback from our customers and markets, the following policy has been approved by the Fonterra Board and applies from 1 June 2010:

- Only wastewater that meets the Californian Standard Title 22 is to be used on pasture or feed that is fed to lactating animals supplying Fonterra.
- No sewage sludge derived from the treatment of human waste may be used to grow pasture or feed that is fed to lactating animals
- If dry stock is fed with feed that has been grown with stabilised sludge or wastewater that that does not meet the Californian Standard Title 22, the stock must not be fed the material for 30 days before the start of lactation if they will be supplying Fonterra
- Any suppliers using human sewage must meet the requirements of their local Regional Council
- District Council will be responsible for the production and implementation of the required management plan.

If you have any questions or comments relating to this policy please contact Sue Walsh, Food Safety Systems Manager on 021 927 358.

Yours Faithfully

A handwritten signature in black ink, appearing to read "Andy Goodwin".

Andy Goodwin
GM Milk Supply, Technical & Assurance

APPENDIX 5

CONSULTATION WITH LANDOWNERS

Tolovea Farms Limited

Mangawhai Golf Club

Te Arai Golf Course



Andrew mc

MANGAWHAI GOLF CLUB

NEW ZEALAND

221 Molesworth Drive, Mangawhai, Northland, N.Z. P.O. Box 66, Mangawhai 0540
Telephone: 0-9-431 4807 Facsimile: 0-9-431 4300 E-mail: steve@mangawhaigolf.co.nz
www.mangawhaigolf.co.nz

Mr Andrew McGregor

12th March 2014

Water Services Planning Engineer

Kaipara District Council

Private Bag 1001

Dargaville 0340



CC Steve Ruru

Dear Mr McGregor,

Your correspondence dated 19th February 2014, addressed to our President, Mr Mike Howard, was tabled at our Board of Directors Meeting on 3rd March.

In that correspondence you enquired whether the Mangawhai Golf Club had interest in accessing the treated waste water from the treatment plant for irrigation purposes.

Our response to the enquiry is formalised in the following paragraph.

Mangawhai Golf Club is not currently in a financial position to make use of the said water for irrigation purposes. We would however consider favourably the treated water being stored in the swamp area on the south-western location on the course. This storage availability is substantial and could be facilitated through a series of stepped reservoirs, which combined with appropriate vegetation, would have the benefit of further purifying the water as it passes through the treatment stages. We believe this would be an environmentally friendly option and would additionally be very cost efficient for all concerned.

The club, in keeping with so many sports organisations in today's economic climate, has limited cash with which to fund the works required to clear this swamp area and therefore would look for assistance from council to set this area up initially. The on-going maintenance of the water storage area, in the future, is likely to be within the means of the club to maintain.

We look forward to your further correspondence from you on this matter and if felt appropriate organisation of a site meeting with yourself and council personnel to further explore this option for treated waste water placement.

Yours faithfully,

Steve Hinton

On behalf of the Board of Directors

Grant Pedersen

From: Andrew McGregor [amcgregor@kaipara.govt.nz]
Sent: Thursday, 27 February 2014 8:38 a.m.
To: Grant Pedersen
Subject: FW: Mangawhai Waste water Scheme

Hi Grant,
This is unfortunate, these guys were always indicating an interest.

May be worth writing to other non Fonterra farmers along the pipeline route.

I will look into this next week.

Andrew McGregor
Water Services Planning Engineer



Kaipara District Council
Private Bag 1001
Dargaville 0340

amcgregor@kaipara.govt.nz
Phone 09 4393123
mobile 0275004415

From: Christine Bygrave [<mailto:christinebygrave@gmail.com>]
Sent: Wednesday, 26 February 2014 9:28 p.m.
To: Andrew McGregor
Subject: Re: Mangawhai Waste water Scheme

Hi Andrew,
I have been in touch with Fonterra and we are unable to use the waste water for lactating animals, so we will not be able to use any of the waste water from the Mangawhai Waste Water Scheme.

Regards, Bill Bygrave

On Wed, Feb 26, 2014 at 10:38 AM, Andrew McGregor <amcgregor@kaipara.govt.nz> wrote:

Hello Bill,

Thank you for providing this response.

We will keep in touch as this process proceeds.

Regards

Andrew McGregor

Water Services Planning Engineer



Kaipara District Council

Private Bag 1001

Dargaville 0340

amcgregor@kaipara.govt.nz

Phone 09 4393123

mobile 0275004415

From: Christine Bygrave [mailto:christinebygrave@gmail.com]

Sent: Tuesday, 25 February 2014 9:25 p.m.

To: Andrew McGregor

Subject: Mangawhai Waste water Scheme

Dear Andrew,

Further to our telephone conversation yesterday, Christine and I would like to express our interest in taking treated wastewater from the Mangawhai Waste Water Scheme for irrigation purposes on our Dairy farm. The following are initial discussion points.

Our concerns are the following.

1. The acceptance by Fonterra of milksolids produced from land irrigated by this waste water. Fonterra must be convinced of the quality of the water. This is Number one priority for us.

2. Because of the large financial commitment by us we would require a guaranteed number of years of supply of water.

3. We would need to know how much water and when it would be available to us. This would govern the extent of the irrigation which we may install, pump size, pipe size and area.

4. Dependent on the irrigation system which we installed we would need some control over the inflow onto the farm.

5. A Holding Pond from which to irrigate would seem to be the most practical solution to utilising the waste water. We envisage that this would be emptied daily.

6. The disposal of the waste water and its distribution as we understand it, should be covered by you and your Resource Consent. You have the ultimate control over the quality, and that is monitored by the NRC.

7. We would expect to draw water from the 20th October until the 20th March each year. These are approximate dates.

Yours , Bill Bygrave Director. Tovoalea Farm Ltd

Attention:

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APPENDIX 6
COST ESTIMATES

Mangawhai Effluent Disposal Options - Capital Cost Estimates

DESCRIPTION	Option 1	Option 2	Option 3	Option 4	Option 5	Option 6	Option 7	Option 8
	Total	Total	Total	Total	Total	Total	Total	Total
PRELIMINARY AND GENERAL	755,300	432,100	557,700	705,500	328,300	443,100	345,000	385,300
NEW IRRIGATION AREAS	3,240,000	1,300,000	2,152,500			1,080,000	1,080,000	1,097,000
PIPELINES & WETLAND	945,100	210,100	194,300	3,788,500	1,428,500	873,900	240,100	117,100
IRRIGATION STORAGE TANK	320,000	470,000	470,000	320,000	320,000	470,000	470,000	934,000
UPGRADE FILTERS/UV/PUMPS	370,000	370,000	370,000	410,000	370,000	370,000	370,000	330,000
ANCILLIARY EQUIPMENT	20,000	391,000	391,000			20,000		20,000
ELECTRICAL, INSTRUMENTATION AND CONTROL	140,000	140,000	140,000	185,000	70,000	140,000	140,000	70,000
TOTAL WORKS COST	5,790,400	3,313,200	4,275,500	5,409,000	2,516,800	3,397,000	2,645,100	2,953,400
Contingency	1,737,100	994,000	1,282,700	1,622,800	755,000	1,019,100	793,500	886,100
TOTAL – WORKS plus Contingency	7,527,500	4,307,200	5,558,200	7,031,800	3,271,800	4,416,100	3,438,600	3,839,500
Engineering	903,300	516,900	667,000	843,800	392,600	529,900	412,600	460,700
Total	8,431,000	4,824,000	6,226,000	7,876,000	3,665,000	4,946,000	3,851,000	4,300,000

Mangawhai Effluent Disposal Options - Operating Cost Estimates

Annual Power Costs	40556	40556	40556	23657	23657	32704	27993	38972
Farm Operating Cost (Revenue in brackets) If figure is not in brackets this represents an estimated annual operating loss.	25000	25000	25000			25000	25000	25000
Overall annual Cost (Revenue) for scheme	65556	65556	65556	23657	23657	57704	52993	63972
Discount Rate	7%	7%	7%	7%	7%	7%	7%	7%
NPV (30 Years)	\$594,154	\$594,154	\$594,154	\$214,416	\$214,416	\$522,994	\$480,299	\$579,797

Mangawhai Effluent Disposal Options - Capital Cost Estin

DESCRIPTION	Option 9	Option 10	Option 11	Option 12
	Total	Total	Total	Total
PRELIMINARY AND GENERAL	384,100	254,100	321,000	367,100
NEW IRRIGATION AREAS	1,263,000			
PIPELINES & WETLAND	518,000	299,900	435,900	1,053,200
IRRIGATION STORAGE TANK	320,000	934,000	934,000	934,000
UPGRADE FILTERS/UV/PUMPS	370,000	370,000	610,000	370,000
ANCILLIARY EQUIPMENT	20,000	20,000	20,000	20,000
ELECTRICAL, INSTRUMENTATION AND CONTROL	70,000	70,000	140,000	70,000
TOTAL WORKS COST	2,945,100	1,948,000	2,460,900	2,814,300
Contingency	883,500	584,400	738,300	844,300
TOTAL – WORKS plus Contingency	3,828,600	2,532,400	3,199,200	3,658,600
Engineering	459,500	303,900	383,900	439,000
Total	4,288,000	2,836,000	3,583,000	4,098,000

Mangawhai Effluent Disposal Options - Operating Cost Es

Annual Power Costs	30857	31381	26362	16898
Farm Operating Cost (Revenue in brackets) If figure is not in brackets this represents an estimated annual operating loss.	25000	25000		
Overall annual Cost (Revenue) for scheme	55857	56381	26362	16898
Discount Rate	7%	7%	7%	7%
NPV (30 Years)	\$506,256	\$511,003	\$238,927	\$153,154

Mangawhai Effluent Disposal Options - Capital Cost Estimates

DESCRIPTION	Option 1			Option 1 Total	Option 2			Option 2 Total	Option 3			Option 3 Total	Option 4			Option 4 Total
	STAGE 1	STAGE 2	STAGE 3		STAGE 1	STAGE 2	STAGE 3		STAGE 1	STAGE 2	STAGE 3		STAGE 1	STAGE 2	STAGE 3	
PRELIMINARY AND GENERAL	253700	90600	411000	755,300	153900	125100	153100	432,100	179500	183500	194700	557,700	659000	18000	28500	705,500
NEW IRRIGATION AREAS	1215000	405000	1620000	3,240,000	357500	227500	715000	1,300,000	852500	260000	1040000	2,152,500				
PIPELINES & WETLAND	236300	78800	630000	945,100	57800	36800	115500	210,100	84000	42000	68300	194,300	3788500			3,788,500
IRRIGATION STORAGE TANK		20000	300000	320,000		470000		470,000	20000	450000		470,000	300000	20000		320,000
UPGRADE FILTERS/UV/PUMPS	150000	100000	120000	370,000	150000	100000	120000	370,000	150000	100000	120000	370,000	190000	100000	120000	410,000
ANCILLIARY EQUIPMENT	20000			20,000	391000			391,000	20000	371000		391,000				
ELECTRICAL INSTRUMENTATION AND CONTROL	70000		70000	140,000	70000		70000	140,000	70000		70000	140,000	115000		70000	185,000
TOTAL WORKS COST	1945000	694400	3151000	5,790,400	1180200	959400	1173600	3,313,200	1376000	1406500	1493000	4,275,500	5052500	138000	218500	5,409,000
Contingency	583500	208300	945300	1,737,100	354100	287800	352100	994,000	412800	422000	447900	1,282,700	1515800	41400	65600	1,622,800
TOTAL - WORKS plus Contingency	2528500	902700	4096300	7,527,500	1534300	1247200	1525700	4,307,200	1788800	1828500	1940900	5,558,200	6568300	179400	284100	7,031,800
Engineering	303400	108300	491600	903,300	184100	149700	183100	516,900	214700	219400	232900	667,000	788200	21500	34100	843,800
Stage 1	2,832,000	0	0	2,832,000	1,718,000	0	0	1,718,000	2,004,000	0	0	2,004,000	7,357,000	0	0	7,357,000
Stage 2	0	1,011,000	0	3,843,000	0	1,397,000	0	3,115,000	0	2,048,000	0	4,052,000	0	201,000	0	7,558,000
Total	0	0	4,588,000	8,431,000	0	0	1,709,000	4,824,000	0	0	2,174,000	6,226,000	0	0	318,000	7,876,000

Mangawhai Effluent Disposal Options - Capital Cost Estim

DESCRIPTION	Option 5			Option 5 Total	Option 6			Option 6 Total	Option 7			Option 7 Total	Option 8			Option 8 Total
	STAGE 1	STAGE 2	STAGE 3		STAGE 1	STAGE 2	STAGE 3		STAGE 1	STAGE 2	STAGE 3		STAGE 1	STAGE 2	STAGE 3	
PRELIMINARY AND GENERAL	292300	18000	18000	328,300	203100	90600	149400	443,100	105000	90600	149400	345,000	199700	56400	129200	385,300
NEW IRRIGATION AREAS						405000	675000	1,080,000		405000	675000	1,080,000	160000	240000	697000	1,097,000
PIPELINES & WETLAND	1428500			1,428,500	663800	78800	131300	873,900	30000	78800	131300	240,100	17300	15800	84000	117,100
IRRIGATION STORAGE TANK	300000	20000		320,000	450000	20000		470,000	450000	20000		470,000	914000	20000		934,000
UPGRADE FILTERS/UV/PUMPS	150000	100000	120000	370,000	150000	100000	120000	370,000	150000	100000	120000	370,000	150000	100000	80000	330,000
ANCILLIARY EQUIPMENT					20000			20,000					20000			20,000
ELECTRICAL INSTRUMENTATION AND CONTROL	70000			70,000	70000		70000	140,000	70000		70000	140,000	70000		70,000	70,000
TOTAL WORKS COST	2240800	138000	138000	2,516,800	1556900	694400	1145700	3,397,000	805000	694400	1145700	2,645,100	1531000	432200	990200	2,953,400
Contingency	672200	41400	41400	755,000	467100	208300	343700	1,019,100	241500	208300	343700	793,500	459300	129700	297100	886,100
TOTAL - WORKS plus Contingency	2913000	179400	179400	3,271,800	2024000	902700	1489400	4,416,100	1046500	902700	1489400	3,438,600	1990300	561900	1287300	3,839,500
Engineering	349600	21500	21500	392,600	242900	108300	178700	529,900	125600	108300	178700	412,600	238800	67400	154500	460,700
Stage 1	3,263,000	0	0	3,263,000	2,267,000	0	0	2,267,000	1,172,000	0	0	1,172,000	2,229,000	0	0	2,229,000
Stage 2	0	201,000	0	3,464,000	0	1,011,000	0	3,278,000	0	1,011,000	0	2,183,000	0	629,000	0	2,858,000
Total	0	0	201,000	3,665,000	0	0	1,668,000	4,946,000	0	0	1,668,000	3,851,000	0	0	1,442,000	4,300,000

Mangawhai Effluent Disposal Options - Capital Cost Estim

DESCRIPTION	Option 9			Option 9 Total	Option 10			Option 10 Total	Option 11			Option 11 Total	Option 12			Option 12 Total
	STAGE 1	STAGE 2	STAGE 3		STAGE 1	STAGE 2	STAGE 3		STAGE 1	STAGE 2	STAGE 3		STAGE 1	STAGE 2	STAGE 3	
PRELIMINARY AND GENERAL	238200	36000	109900	384,100	203100	18000	33000	254,100	259800	43200	18000	321,000	283100	18000	66000	367,100
NEW IRRIGATION AREAS	750000		513000	1,263,000												
PIPELINES & WETLAND	298200	120000	99800	518,000	199900		100000	299,900	267900	168000		435,900	733200		320000	1,053,200
IRRIGATION STORAGE TANK	300000	20000		320,000	914000	20000		934,000	914000	20000		934,000	914000	20000		934,000
UPGRADE FILTERS/UV/PUMPS	150000	100000	120000	370,000	150000	100000	120000	370,000	390000	100000	120000	610,000	150000	100000	120000	370,000
ANCILLIARY EQUIPMENT	20000			20,000	20000			20,000	20000			20,000	20000			20,000
ELECTRICAL INSTRUMENTATION AND CONTROL	70000			70,000	70000			70,000	140000			140,000	70000			70,000
TOTAL WORKS COST	1826400	276000	842700	2,945,100	1557000	138000	253000	1,948,000	1991700	331200	138000	2,460,900	2170300	138000	506000	2,814,300
Contingency	547900	82800	252800	883,500	467100	41400	75900	584,400	597500	99400	41400	738,300	651100	41400	151800	844,300
TOTAL – WORKS plus Contingency	2374300	358800	1095500	3,828,600	2024100	179400	328900	2,532,400	2589200	430600	179400	3,199,200	2821400	179400	657800	3,658,600
Engineering	284900	43100	131500	459,500	242900	21500	39500	303,900	310700	51700	21500	383,900	338600	21500	78900	439,000
Stage 1	2,659,000	0	0	2,659,000	2,267,000	0	0	2,267,000	2,900,000	0	0	2,900,000	3,160,000	0	0	3,160,000
Stage 2	0	402,000	0	3,061,000	0	201,000	0	2,468,000	0	482,000	0	3,382,000	0	201,000	0	3,361,000
Total	0	0	1,227,000	4,288,000	0	0	368,000	2,836,000	0	0	201,000	3,583,000	0	0	737,000	4,098,000

APPENDIX 7

MULTI-CRITERIA ANALYSIS MATRIX

MULTI-CRITERIA ANALYSIS MATRIX

Non-price criteria:

All of the values used made in the Matrix are subjective and could be open to debate. The purpose is not to provide an exact comparison of the options, but to make people aware of the relative advantages and disadvantages of each option, and promote discussion and further evaluation of the promising options.

Land Issues: Options 2 & 3 being able to be contained within the Lincoln Downs farm, are not expected to have any land issues.

The golf course has indicated a willingness to take effluent for wetland disposal, and possible irrigation. Therefore, there are unlikely to be any land issues for Options 9, 10, 11 & 12.

The location of the Hakaru River discharge would be on land owned by Mr. Bill Bygraves, and Council consider there are unlikely to be any significant land issues associated with this Option 8.

The pipelines through town for Options 4, 5 & 6 should mostly be able to traverse road reserves, and any land issues should therefore be relatively minor. There may be more land issues relating to crossing the foreshore and outfall routes.

Option 1 would require significantly more land, and therefore land would be an issue.

Construction/operation Risk:

The ocean outfall option would have the highest construction risk and the harbour outfall less risk. Operation of large areas of maximised irrigation would carry a significant operational risk, as to the relative costs and revenue for the operation, as well as weather related risks.

The river discharge should carry a low construction and operation risk.

Consenting Risk:

It is considered that all of the discharge to water options have the risk that a consent may be appealed by some objectors. The upper estuary is seen as the riskiest consent option.

The golf course options are considered to be a low risk of objection, with good consultation and design.

Local Acceptance:

A judgement has been made about the relative local acceptance of each option. This should be tested by Council for the favoured options. Reuse of effluent at the golf course is considered to be an option that should win some favour with local people.

Resilience in Wet Dry years:

Resilience in wet years is considered of greater importance due to the difficulty of land disposal in wet years. The land disposal only options will have greater difficulty coping in wet years, but will cope well in dry years. Options with both a water discharge and land disposal will cope reasonably well in both wet and dry years. Due to greater dilution available during wet years, the river and upper estuary options will cope well in wet years.

The ocean outfall option should remain unaffected in wet or dry years.



Project: **Mangawhai Wastewater Effluent Disposal**
 Client: **Kaipara District Council**
 Sheet: **Effluent Disposal Options**

Job #: **1012-135494-02**
 Date: **11/09/2014**
 Prepared by: **AFP**
 Checked by: **GWP**

Filepath: N:\1012\135494_02\400 Tech\430 Cost Schedules\[KDC Effluent Disposal Options Study Cost v2-Sept-afp-gwp.xlsx]Cap Cost Summary

Criteria	W e i g h t i n g %	Mangawhai Wastewater Effluent Disposal Options											
		1	2	3	4	5	6	7	8	9	10	11	12
		1 - Lincoln Downs - Deficit Irrigation	2 - Lincoln Downs - Maximised Irrigation	3 - Lincoln Downs - Combination Irrigation and SDI LTS	4 - Ocean Outfall (no Irrigation)	5 - Harbour Mouth Outfall (no Irrigation)	6 - Mid-estuary Outfall and Irrigation	7 - Upper Estuary Outfall and Irrigation	8 - Hakeru River Discharge and Irrigation	9 - Golf Course and Irrigation	10 - Golf Course, Hakeru River and Irrigation	11 - Golf Course, Hakeru River (no Irrigation)	12 - Golf Course only (no Irrigation)
<i>NPV Cost, \$millions</i>	<i>\$M</i>	9.0	5.4	6.8	8.1	3.9	5.5	4.3	4.9	4.8	3.3	3.8	4.3
Cost	33%	0.5	4.9	3.2	1.7	6.8	4.8	6.2	5.6	5.7	7.4	6.9	6.3
Land Issues	10%	2	8	8	3	4	4	5	4	7	4	5	6
Construction/operation Risk	10%	5	2	6	1	3	4	6	7	8	6	6	6
Consenting Risk	25%	6	7	8	3	4	2	2	5	8	7	6	2
Local Acceptance	8%	5	8	8	3	3	2	1	6	8	7	7	2
Resilience in Wet years	10%	1	1	2	8	8	5	5	7	5	7	7	4
Resilience in Dry years	4%	6	6	7	9	8	4	4	4	4	3	2	4
Overall Rank (High score is better)	100%	3.1	5.4	5.6	3.1	5.3	3.7	4.4	5.5	6.7	6.6	6.2	4.5

(Colour scale - GREEN is best)

Attribute scoring

1 - Adverse, 5 - Average or moderate, 10 - Excellent

APPENDIX 8

PROPOSAL FROM AGRESEARCH

Agricultural advice to Kaipara District Council for Effluent Irrigation

Aim: to determine the feasibility of generating income from improved cropping and better irrigation and pasture management.

Proposed work plan

First stage:

A brief report outlining the potential crops/forages that can be grown under this system; taking into account the local growing conditions; farm systems; seasonal effluent loads; current land area available for irrigation and if more land were made available. The report will conclude by recommending the preferred crop/forage options to be investigated further (below).

Second stage:


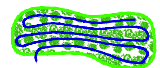


A report investigating the selection of crops agreed between KDC, Grant Pedersen and AgResearch with regards to:

- Costs associated with producing selected crops (e.g. sowing, fertilisers, pest and weed control)
- Harvest costs and methods for selected crops
- Average range of yields
- Range of expected prices for selling crops/forages
- Comments about risks or resilience of the various crops/forages and how they might fit into a farm system in terms of feed production vs. demand for different farm systems/enterprises.

APPENDIX 9
**TENTATIVE CONSTRUCTED WETLAND
LAYOUT**



LEGEND

	EXISTING WETLAND
	POTENTIAL FUTURE EFFLUENT CONSTRUCTED WETLAND
	NATURAL WATER FLOW
	PROPOSED EFFLUENT MAIN


AUCKLAND OFFICE
 DILWORTH HOUSE 71 GREAT SOUTH ROAD
 NEWMARKET AUCKLAND 1051
 T +64 9 917 5000
 W www.harrisongrierson.com

REF	REVISIONS	BY	DATE
1	WETLANDS UPDATED	AFP	03.09.14

MANGAWHAI HEADS
MANGAWHAI
WASTEWATER SCHEME

POTENTIAL FUTURE EFFLUENT
WETLAND - MANGAWHAI GOLF COURSE
OPTIONS 9, 10 AND 11


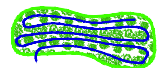


ORIGINATOR:	DATE:	SIGNED:	PLOT BY:	MNP
DRAWN:	DATE:	SIGNED:	PLOT DATE:	15.09.14
CHECKED:	DATE:	SIGNED:	SURVEY BY:	
APPROVED:	DATE:	SIGNED:	SURVEY DATE:	

PROJECT No:	SCALES: 1:750-A1 APPROX 1:1500-A3 APPROX	A1
DRAWING No:	135494-GA100	REV 1

DRAFT ONLY



LEGEND

-  EXISTING WETLAND
-  POTENTIAL FUTURE EFFLUENT CONSTRUCTED WETLAND
-  NATURAL WATER FLOW
-  PROPOSED EFFLUENT MAIN

MANAGAWHAI
GOLF COURSE


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REF	REVISIONS	BY	DATE
-			

PROJECT: MANGAWHAI HEADS
MANGAWHAI
WASTEWATER SCHEME

TITLE: POTENTIAL FUTURE EFFLUENT
WETLAND - MANGAWHAI GOLF COURSE
OPTION 12

ORIGINATOR:	DATE:	SIGNED:	PLOT BY:	MNP
DRAWN:	DATE:	SIGNED:	PLOT DATE:	15.09.14
CHECKED:	DATE:	SIGNED:	SURVEY BY:	
APPROVED:	DATE:	SIGNED:	SURVEY DATE:	

ISSUE STATUS:

PROJECT No:	SCALES: 1:750-A1 APPROX 1:1500-A3 APPROX	A1
DRAWING No:	135494-GA101	REV

DRAFT ONLY