FILE: 6232
(01 to 04, and 07)
Replacement

Document Date: 08.09.2017

Resource Consent

Pursuant to the Resource Management Act 1991, the Northland Regional Council (hereinafter called "the Council") does hereby grant a Resource Consent to:

OTEHEI BAY HOLDINGS LIMITED, PO BOX 106267, AUCKLAND CITY, AUCKLAND 1143

To carry out the following activities associated with the operation of a restaurant, and accommodation and visitor facilities at Otehei Bay, Urupukapuka Island:

Note: All location co-ordinates in this document refer to Geodetic Datum 2000, New Zealand Transverse Mercator Projection.

AUT.006232.01.03	**Discharge treated wastewater to land on Pt Urupukapuka 1B and 1D, at or about location co-ordinates 1712375E 6102000N.**
AUT.006232.02.02	**Discharge contaminants (primarily odour) to air from a wastewater treatment and disposal system on Pt Urupukapuka 1B, 1C and 1D, at or about respective location coordinates 1712375E 6102000N, 1712170E 6101880N and 1712220E 6101910N.**
AUT.006235.03.02	**Undertake earthworks associated with the construction of buildings, a boat yard, tennis court, ancillary facilities and services, and a drainage system on Pt Urupukapuka 1C and 1D, at or about location co-ordinates 1712160E 6101820N.**
AUT.006235.04.02	**Place and use a wastewater pipeline over the bed of an unnamed tributary of Otehei Bay on Pt Urupukapuka 1D at or about location co-ordinates 1712250E 6101900N and 1712150E 6101840N.**
AUT.006235.07.03	**Take groundwater from two existing bores to supply water for accommodation, restaurant and other visitor related facilities on Pt Urupukapuka 1D at or about location co-ordinates 1712221E 6101907N and 1712226E 6101907N.**

Subject to the following conditions:

General Conditions to all Consents

1 The Consent Holder shall, for the purposes of adequately monitoring these consents as required under Section 35 of the Resource Management Act 1991, on becoming aware of any contaminant associated with the Consent Holder's operations escaping otherwise than in conformity with these consents:

(a) Immediately take such action, or execute such work as may be necessary, to stop and/or contain such escape;

(b) Immediately notify the Northland Regional Council by telephone of an escape of contaminant;

(c) Take all reasonable steps to remedy or mitigate any adverse effects on the environment resulting from the escape; and

(d) Report to the Northland Regional Council's Compliance Manager in writing within one week on the cause of the escape of the contaminant and the steps taken or being taken to effectively control or prevent such escape.

For telephone notification during the Northland Regional Council's opening hours the council's assigned monitoring officer for these consents shall be contacted. If that person cannot be spoken to directly, or it is outside of the council's opening hours, then the Environmental Emergency Hotline shall be contacted.

Advice Note: *The Environmental Emergency Hotline is a 24 hour, seven day a week, service that is free to call on 0800 504 639.*

2 The Northland Regional Council may in accordance with Section 128 of the Resource Management Act 1991, serve notice on the Consent Holder of its intention to review the conditions of these consents. Such notice may be served annually during the month of October. The review may be initiated for any one or more of the following purposes:

(a) To deal with any adverse effects on the environment that may arise from the exercise of these consents and which it is appropriate to deal with at a later stage;

(b) To require the adoption of the best practicable option to remove or reduce any adverse effect on the environment;

(c) To review the allocation of the groundwater resource

The Consent Holder shall meet all reasonable costs of any such review.

AUT.006232.01.03 - Discharge to Land

3 The Consent Holder shall notify the Northland Regional Council, in writing, of the date that this consent is intended to be exercised for the first time, at least two weeks beforehand.

4 The Consent Holder shall, at least one month prior to the commissioning of the wastewater treatment and disposal system, forward a Management Plan to the Northland Regional Council for certification. This Management Plan shall include but not be limited to the following:

(a) A maintenance schedule for the wastewater treatment and disposal system that details the required maintenance and the frequency of that maintenance;

(b) A schedule of any maintenance that the on-site person shall be responsible for and the frequency of that maintenance;

(c) A contingency plan in the event that an alarm is activated or there is an unforeseen discharge of sewage from the wastewater treatment and disposal system, including the reticulation network.

The consent to discharge treated wastewater to land may not be exercised until the Northland Regional Council has certified the Management Plan.

5 The wastewater treatment and disposal system shall be operated and maintained in accordance with the approved Management Plan, required to be prepared in accordance with Condition 4. Changes may be made to the Management Plan with the prior certification of the Northland Regional Council.

6 The Consent Holder shall, prior to the commissioning of the wastewater treatment and disposal system, provide to the Northland Regional Council a copy of the Department of Conservation approval to discharge treated wastewater onto their land.

***Advice Note**: This resource consent in no way negates the requirement of the Consent Holder to obtain the approval of the Department of Conservation to discharge treated wastewater onto their land.*

7 The quantity discharged shall not exceed 46.2 cubic metres per day.

8 A meter with accuracy of ±5% shall be installed and maintained on the outlet from the wastewater treatment system to the disposal area. This meter shall be used to measure the daily volume of wastewater discharged to land.

9 The Consent Holder shall keep written records of the quantity of wastewater discharged daily to land. A copy of the written records for the previous year (1 April to 31 March) shall be forwarded to the Northland Regional Council's assigned monitoring officer by 1 May each year, and also immediately on written request.

10 The wastewater treatment and disposal system, including the reticulation network, shall be constructed generally in accordance with the recommendations of the Innoflow Technologies Limited report entitled "*Proposal for Wastewater Collection and Management System*", Project Reference: Q3500, Dated: 8 October 2004 (**attached**). However, if there are any differences or apparent conflict between these documents and any conditions of this consent, then the conditions of this consent shall prevail.

11 The wastewater treatment system and reticulation network shall be located in general accordance with the Richardson Stevens Consultants Limited drawing entitled "*Zane Grey Resort, Urupukapuka Island*", Project 3693, Sheet 1b, dated 7 October 2004 (**attached**).

Advice Note: *For compliance purposes, the Northland Regional Council has determined that the definition of "in general accordance" allows the Consent Holder to locate the wastewater treatment system either at the location shown on the attached plan or adjacent to the shed, diesel storage and workshop area that is shown on the attached plan. The Northland Regional Council also considers that "in general accordance" allows the Consent Holder to install the wastewater reticulation pipeline onto the existing bridges over the open drain through the complex and, as a consequence of this change or any change in location of the wastewater treatment system, to relocate the wastewater reticulation pipeline to the wastewater treatment system, provided all other conditions of these resource consents are complied with.*

12 The wastewater disposal area shall be located in general accordance with the Richardson Stevens Consultants Limited drawing entitled "*Zane Grey Wastewater Irrigation Field Location*" Project 3693, dated 28 August 2004 (**attached**).

Advice Note: *If there are any changes to the location of the wastewater disposal area as a result of gaining the approval of the Department of Conservation, then the Consent Holder shall apply to the Northland Regional Council for a change to Condition 12.*

13 The treated wastewater shall be discharged to land using a minimum of 9.24 kilometres of wastewater irrigation line that has pressure compensating drip emitters installed at no greater than 600 millimetre intervals along the irrigation line and no less than a one metre horizontal separation distance between any lateral irrigation lines. In addition, the treated wastewater shall not be applied to land at an areal loading rate greater than 5 litres per square metre per day.

14 No wastewater irrigation line shall be installed within 15 metres of any groundwater spring or surface watercourse and no pressure compensating drip emitters shall be installed within 5 metres of any identifiable stormwater flow path through the wastewater disposal area.

15 The Consent Holder shall, at all times, ensure that the irrigation line used for the disposal of treated wastewater is either:

(a) Located beneath the surface of the soil; or

(b) Covered by a woody material (e.g. bark), or an appropriate alternative, to a minimum depth of 50 millimetres.

16 To prevent overflows, an alarm system shall be installed and maintained within all wastewater pump chambers of the reticulation network and the wastewater treatment system, which is activated when high wastewater levels and/or wastewater pump failures occur. This alarm system shall have an audible and visual alarm mechanism installed that is capable of alerting the appropriate on-site person that an alarm has been activated. In addition, the alarm system shall, at all times, be connected by electronic link to a 24 hour remote monitoring system. This remote monitoring system shall immediately notify the maintenance contractor when any alarm is activated.

17 To enable the collection of treated wastewater samples, safe and easy access shall be provided and maintained to a sampling point located after the outlet from the central wastewater treatment system and prior to the wastewater being pumped to the disposal area.

18 Stormwater runoff shall be prevented from entering any wastewater tank.

19 The construction of the wastewater treatment and disposal system, including the reticulation network, shall be supervised by Innoflow Technologies Limited, or its authorised agent. The Consent Holder shall, prior to the commissioning of the wastewater treatment system, submit to the Northland Regional Council:

(a) A certificate of compliance or produce a statement from Innoflow Technologies Limited, or its authorised agent. The certificate or statement shall provide sufficient details and information to enable the Northland Regional Council to verify compliance with Conditions 8 and 10 to 18; and

(b) Final "as built" plans that show the siting of all components of the wastewater treatment and disposal system, including the reticulation network. For the purpose of this Condition, the Consent Holder shall ensure that the "as built" plans are drawn to scale and provide sufficient detail for a Northland Regional Council monitoring officer to locate all structures identified on the plans.

Advice Note: *For the purposes of this condition, the "as built" plans required to be submitted to the District Council as part of the building consent process are considered to be appropriate to fulfil the requirements of Condition 19(b).*

20 The wastewater treatment and disposal areas shall be adequately fenced to prevent access by stock and unauthorised persons. Appropriate signs shall be placed at the wastewater treatment area and at regular intervals on the fence around the disposal area advising the public not to enter the areas.

21 The wastewater treatment and disposal system shall be maintained by a suitably qualified person(s) who has proven experience in maintaining such systems. The Consent Holder shall, prior to the exercise of this consent, provide to the Northland Regional Council, in writing, the name and contact details (mailing address and telephone number) of the suitably qualified and experienced person(s) who is responsible for the maintenance of the wastewater treatment and disposal system. In the event that this responsibility is transferred to a new person(s), the Consent Holder shall immediately advise the Northland Regional Council of the name and contact details of this new person. In addition, the Consent Holder shall ensure that the suitably qualified and experienced person(s) forward to the Northland Regional Council every three months a copy of each maintenance report that details the maintenance that has been undertaken on the wastewater treatment and disposal system.

Advice Note: *For compliance purposes, it is considered that a "suitably qualified person who has proven experience in maintaining such systems" shall be either a person employed or trained by Innoflow Technologies Limited, or someone who can provide evidence of experience in maintaining such wastewater treatment and disposal systems.*

22 There shall be no ponding or surface runoff of any contaminants from any wastewater tank or the disposal area as a result of the exercise of this consent.

23 Neither the 5-day biochemical oxygen demand (BOD_5) nor the total suspended solids (TSS) concentration in the treated wastewater shall exceed 20 grams per cubic metre, as measured in any single wastewater sample taken from a point located after the outlet from the wastewater treatment system and prior to the wastewater being pumped to the disposal area.

AUT.006232.02.02 Discharge to Air

24 To minimise the likelihood of undesirable odours being emitted, the Consent Holder shall install and maintain activated carbon filters on all vents from the wastewater treatment system.

25 The Consent Holder's operations shall not give rise to any discharge of contaminants, at or beyond the legal boundary of on Pt Urupukapuka 1B, 1C and 1D that are deemed by a Northland Regional Council monitoring officer to be noxious, dangerous, offensive or objectionable.

AUT.006235.03.02 Earthworks

26 The quantity of earthworks shall not exceed 500 cubic metres.

27 The scale and location of the earthworks shall be generally in accordance with the information supplied in the Richardson Stevens report entitled "Zane Grey Resort Ltd, Otehei Bay Urupukapuka Island, Visitor Accommodation and Wharf Upgrading, Resource Consent Applications Engineering Assessments" Dated 30 March 2004.

28 The Consent Holder shall notify the Northland Regional Council, at least two weeks before any earthworks are to commence, of the intended commencement date for the earthworks.

29 To minimise the disturbance of the natural ground surface, the earthworks associated with the construction of the tennis court shall be limited to the placement of material on top of the natural ground surface only.

30 To minimise the risk of erosion, no earthworks shall be carried out between 1 May and 30 September in any year without the prior written approval of the Northland Regional Council.

31 The Consent Holder shall, at least 20 working days prior to the commencement of any earthworks at the site, forward to the Northland Regional Council's assigned monitoring officer for written approval, an Erosion and Sediment Control Plan. This plan shall include, but not be limited to the following:

(a) The expected duration (timing and staging) of the proposed earthworks;

(b) Erosion and sediment controls, including specific measures for the control of sediment for pipeline construction on steep slopes;

(c) Catchment boundaries for the sediment control structures;

(d) The commencement and completion dates for the implementation of the proposed erosion and sediment controls;

(e) Diagrams and/or plans, of a scale suitable for on-site reference, showing the locations of all earthworks, disposal sites for unsuitable materials, erosion and silt control structures/measures, and water quality sampling sites;

(f) The name and contact telephone number of the person responsible for monitoring and maintaining all silt detention structures; and

(g) Contingency provisions for the potential effects of large/high intensity rain storm events.

For compliance purposes, the "*Erosion and sediment controls*" required by part (b) shall be designed in accordance with the principles and guidelines contained within the document entitled "*Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region*", Guideline Document 2016/005, dated June 2016.

The earthworks consent may not be exercised until the Northland Regional Council has certified the Erosion and Sediment Control Plan.

32 The earthworks shall be carried out in accordance with the approved Erosion and Sediment Control Plan, required to be prepared in accordance with Condition 31. Changes may be made to the Erosion and Sediment Control Plan with the certification of the Northland Regional Council.

33 The Consent Holder shall minimise contamination of surface water by ensuring that slash, soil, debris and detritus is not placed in a position where it may enter any water body.

34 All areas of bare land including batters and bunds, shall be established with suitable grasses and/or legumes, or other suitable groundcover within one month of the completion of earthworks in that area to achieve an 80% ground cover within three months following completion of works. Temporary mulching shall be carried out to achieve total ground cover of any areas of ground left bare or unprotected where it is not possible to achieve the above standards.

35 Refuelling and servicing of machinery shall be carried out in such a way that soil or water at the site is not contaminated. If any accidental spillage of oil or fuel to land occurs, all contaminated soil shall be collected and removed to a disposal site approved by the Northland Regional Council.

36 Notwithstanding any other conditions, the natural colour and clarity of the coastal waters of Otehei Bay shall not be changed to a conspicuous extent, as a result of the exercise of this consent.

37 A qualified archaeologist shall monitor all earthworks. The Consent Holder shall gain the appropriate authority from the New Zealand Historic Places Trust to damage, destroy or modify any identified archaeological sites within the proposed area of earthworks prior to any earthworks commencing. In the event of unexpected archaeological sites or koiwi being uncovered as a result of any earthworks at the site, activities in the vicinity of the discovery must cease and the Northland Regional Council notified as soon as practicable. (The Northland Regional Council will then notify the appropriate Tangata Whenua entity.) The Consent Holder shall not recommence works in the area of the discovery until the relevant Historic Places Trust approvals to damage, destroy or modify such sites have first been obtained.

AUT.006235.04.02 Wastewater Pipeline Over the Bed of a Watercourse

38 There shall be no escape of wastewater to the unnamed tributary of Otehei Bay from any wastewater pipeline installed over the bed of the unnamed tributary of Otehei Bay.

39 To minimise the potential for any contamination to occur, the wastewater pipeline over the bed of the unnamed tributary of Otehei Bay shall be installed inside another larger diameter pipe.

AUT.006235.07.03 Groundwater Take

40 The quantity taken from the bores shall not exceed:

(a) 41 cubic metres per day between 1 October and 30 April; nor

(b) 23 cubic metres per day between 1 May and 30 September each year between 1 April and 31 March; nor

(c) 7,976 cubic metres per year, being 1 July to 30 June.

41 The Consent Holder shall install, operate and maintain meters with an accuracy of ±5% to measure the total quantity taken from each bore. The meters shall be installed, operated and maintained in accordance with the manufacturer's specifications. The Consent Holder shall, at all times, provide safe and easy access to these meters for the purposes of undertaking visual inspections of the meters and water take measurements.

42 The Consent Holder shall monitor the exercise of this consent in accordance with the **attached** Monitoring Programme (Schedule A). The Consent Holder shall forward the results of all monitoring specified by the Monitoring Programme (Schedule A) to the Northland Regional Council by the 1 May each year, and also immediately on written request by the Northland Regional Council.

43 The Consent Holder may, at any time, apply to the Northland Regional Council to amend any part of the Monitoring Programme (Schedule A). Any changes to the Monitoring Programme (Schedule A) shall only take effect after the written approval of the Northland Regional Council has been obtained.

44 The Northland Regional Council reserves the right to require the Consent Holder to cease the exercise of this consent when the concentration of chloride in water delivered by the bore, as measured by standard methods, is greater than 230 grams per cubic metre.

Lapsing Provision

45 Consents **AUT.006232.01.03, AUT.006232.02.02, AUT.006232.03.02, AUT.006232.04.02** shall lapse on the 1 October 2022 unless before this date the consents have been given effect to.

Advice Note: *An application can be made to the council in accordance with Section 125 of the Act to extend the period after which the consent lapses. Such an application must be made before the consent lapses.*

EXPIRY DATE: 1 SEPTEMBER 2027

These consents are granted this Eighth day of September 2017 under delegated authority from the Council by:

Stuart Savill
Consents Manager

SCHEDULE A

GROUNDWATER ENVIRONMENTAL MONITORING AND CONTINGENCY PLAN

1 INTRODUCTION

This Schedule sets out the monitoring to be carried out to monitor the effects of the groundwater take and the actions to be taken in the event that the monitoring suggests adverse effects on the surrounding environment.

2 MONITORING OF GROUNDWATER TAKE

The Consent Holder shall keep written records of the quantities of water taken daily from each production bore between 1 December to 1 April and then weekly at all other times.

3 MONITORING BORES

The Consent Holder shall monitor the bores identified in Table 1, in accordance with Table 1.

TABLE 1: Monitoring Requirements

Bore	Location Co-ordinates	Monitoring Criteria
Bore 1 – Zane Grey Resort Ltd old abstraction bore	1712183N 6101829E	(a) Static Water levels and electrical conductivity weekly from the 1 December to 1 April and monthly at all other times. (b) Where any electrical conductivity sample exceeds 450 us/cm consequently a chloride concentration sample shall be taken
Bore 5 - Zane Grey Resort Ltd new abstraction bore	1712226E 6101907N	(a) Static Water levels and electrical conductivity weekly from the 1 December to 1 April and monthly at all other times. (b) Where any electrical conductivity sample exceeds 450 us/cm consequently a chloride concentration sample shall be taken
Bore 4 – Department of Conservation	1712258E 6101704N	(a) Static Water levels and electrical conductivity weekly from the 1 December to 1 April and monthly at all other times. (b) Where any electrical conductivity sample exceeds 450 us/cm consequently a chloride concentration sample shall be taken

All location co-ordinates referred to in this document are Geodetic Datum 2000, New Zealand Transverse Mercator Projection.

Each measurement of static water level shall be taken at least 5 hours after cessation of pumping. The static water level measurement shall be collected to within an accuracy of ± 0.02 metres. The time and date of the static water level measurement shall be recorded.

Advice Note: *An option the Consent Holder may want to consider is the installation of a water level recorders to obtain accurate water level monitoring for the bores.*

Electrical conductivity measurements shall be recorded in accordance with the *"New Zealand guidelines for collection of groundwater samples for chemical and isotopic analyses. 1991".* The time and date of the measurement shall be recorded. The device used to measure electrical conductivity shall be calibrated at least once annually in accordance with the manufacturer's specifications. The results of the calibration shall be included in the next monthly report to Northland Regional Council, as required by Section 7 of this Schedule.

A groundwater sample shall be collected from the bores for chloride analysis. The samples shall be collected in accordance with the *"New Zealand guidelines for collection of groundwater samples for chemical and isotopic analyses. 1999"* and shall be analysed for chloride concentration. The time and date of the sample collection shall be recorded. At the time of sample collection an electric conductivity measurement shall be recorded to enable correlation with the chloride concentration results.

A Telarc-registered laboratory shall carry out the analysis.

4 RAINFALL

A rainfall gauge shall be installed at an appropriate location onsite. Rainfall measurements shall be recorded daily.

5 SALTWATER INTRUSION

In the event that monitoring, required to be undertaken in accordance with this Schedule, shows chloride concentrations of between 150 and 250 milligrams per litre in the monitoring Bore 4 and Bore 5 in Table 1, as a result of the groundwater take, the Consent Holder shall:

(a) Immediately notify the Northland Regional Council;

(b) Review all monitoring data; and

(c) Implement mitigation measure as necessary to prevent saltwater contamination.

In the event that monitoring, required to be undertaken in accordance with this Schedule, shows chloride concentrations exceeding 250 milligrams per litre in the monitoring Bore 1 in Table 1, as a result of the groundwater take, the Consent Holder shall:

(a) Immediately notify the Northland Regional Council;

(b) Review all monitoring data; and

(c) Implement mitigation measure as necessary to prevent saltwater contamination.

6 CONTINGENCY ACTIONS

The following measures to mitigate potential adverse effects as a result of the proposed groundwater takes are to be considered by the Consent Holder:

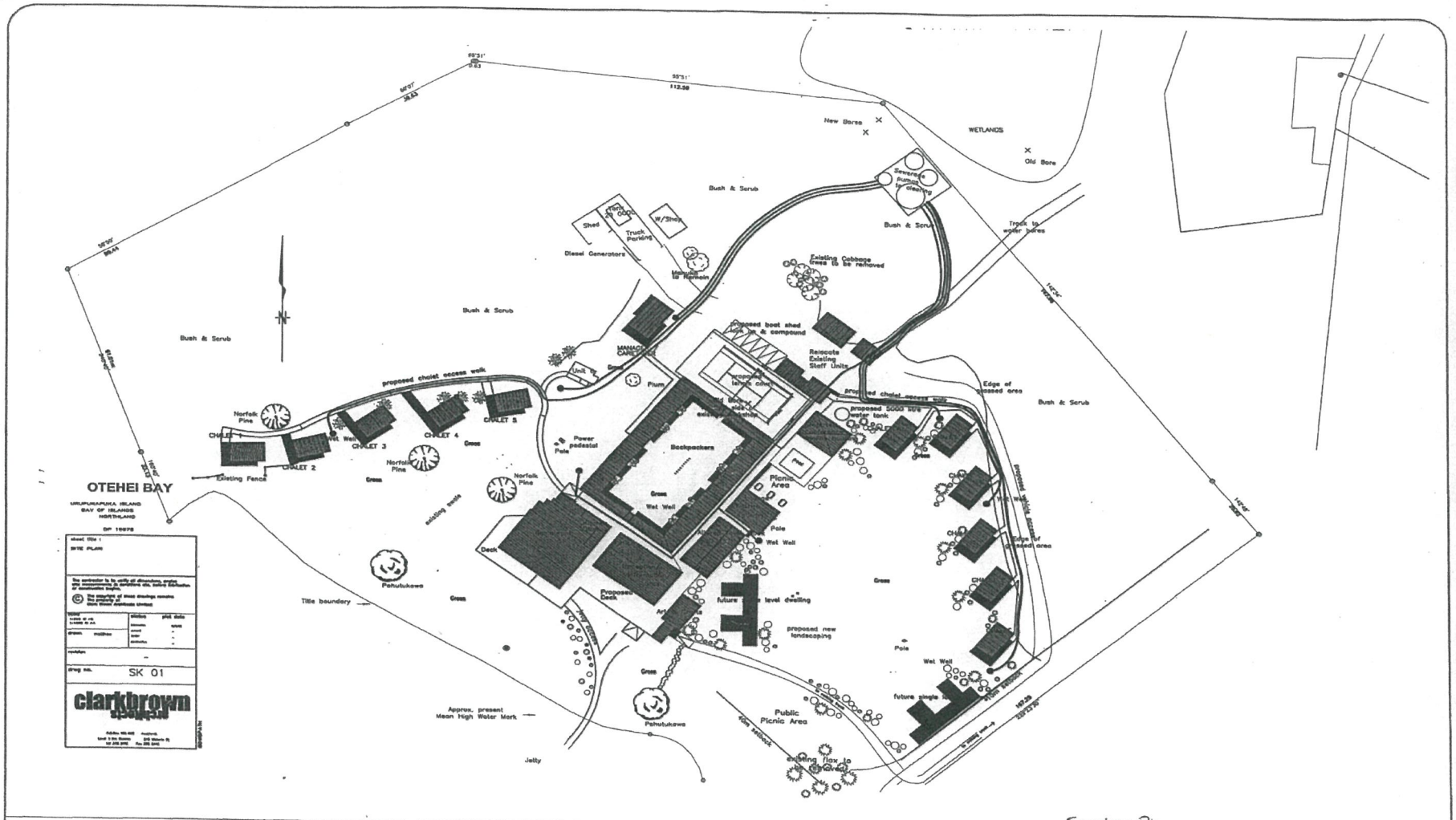
- Rain water collection to be used as a supplementary and emergency water supply; and
- Implementation of Water Conservation Strategy;
- Reducing backpacker numbers;
- Decommissioning the swimming pool;
- No boat washing;
- Education of guests to conserve water;
- Installation of water saving devices including limited flow shower nozzles and timers, low flush toilets, aerators on taps and low water usage washing appliances;
- Investigate additional rain water collection;
- Investigate and seek to abstract water from alternative sources; and
- Cessation of pumping.

Advice Note: *The Northland Regional Council reserves the right to require the Consent Holder to cease the exercise of this consent at all such times as the chloride level in water delivered by the bores identified in the Table 1 of Schedule 1 is measured by standard methods to be greater than 250 grams per cubic metre.*

7 REPORTING

The Consent holder shall report the results of the monitoring undertaken in accordance with this Schedule to the Northland Regional Council monthly, and also immediately on the written request by the Northland Regional Council.

The Consent Holder shall notify the Northland Regional Council within 24 hours of receipt of chloride concentration monitoring results, carried out in accordance with Table 1, that exceed 150 milligrams per litre and proposed actions (mitigation measures) to be implemented.



2 Seaview Road, Whangarei.
Ph. (09)4383273. Fax. (09) 4385734.
engineers@richardsonstevens.co.nz

Richardson Stevens Consultants (1996) Ltd CIVIL & STRUCTURAL ENGINEERS

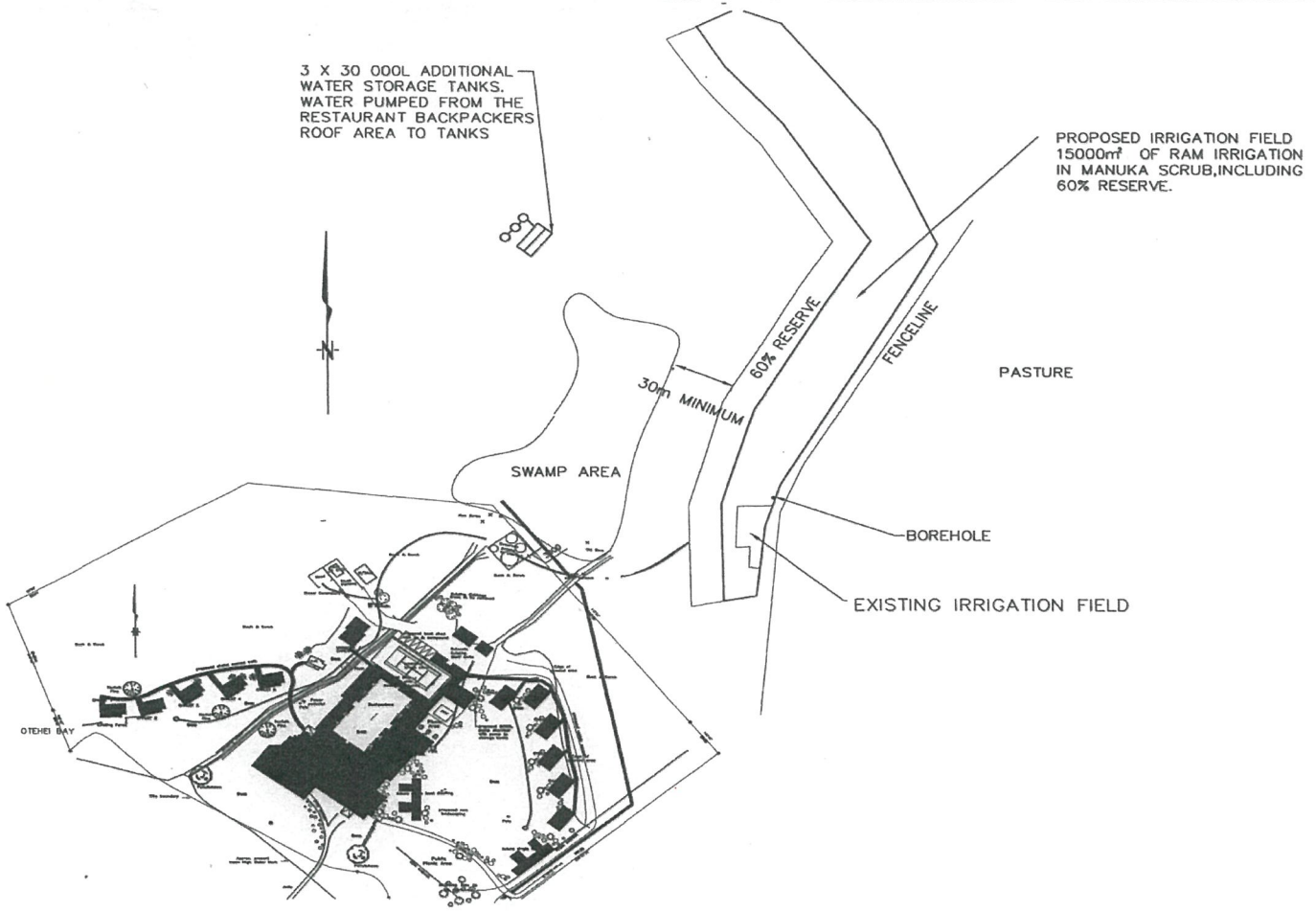
ZANE GREY RESORT, URUPUKAPUKA ISLAND

Services Plan.

~~EFFLUENT MANAGEMENT PLAN~~	
Date:	AMENDMENTS

Project:	3693
Drawn:	MHPR
Date:	7th OCT.2004
Scale:	1/1000 @ A3

Sheet 1b



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Richardson Stevens Consultants (1996) Ltd CIVIL & STRUCTURAL ENGINEERS

ZANE GREY WASTEWATER IRRIGATION FIELD LOCATION

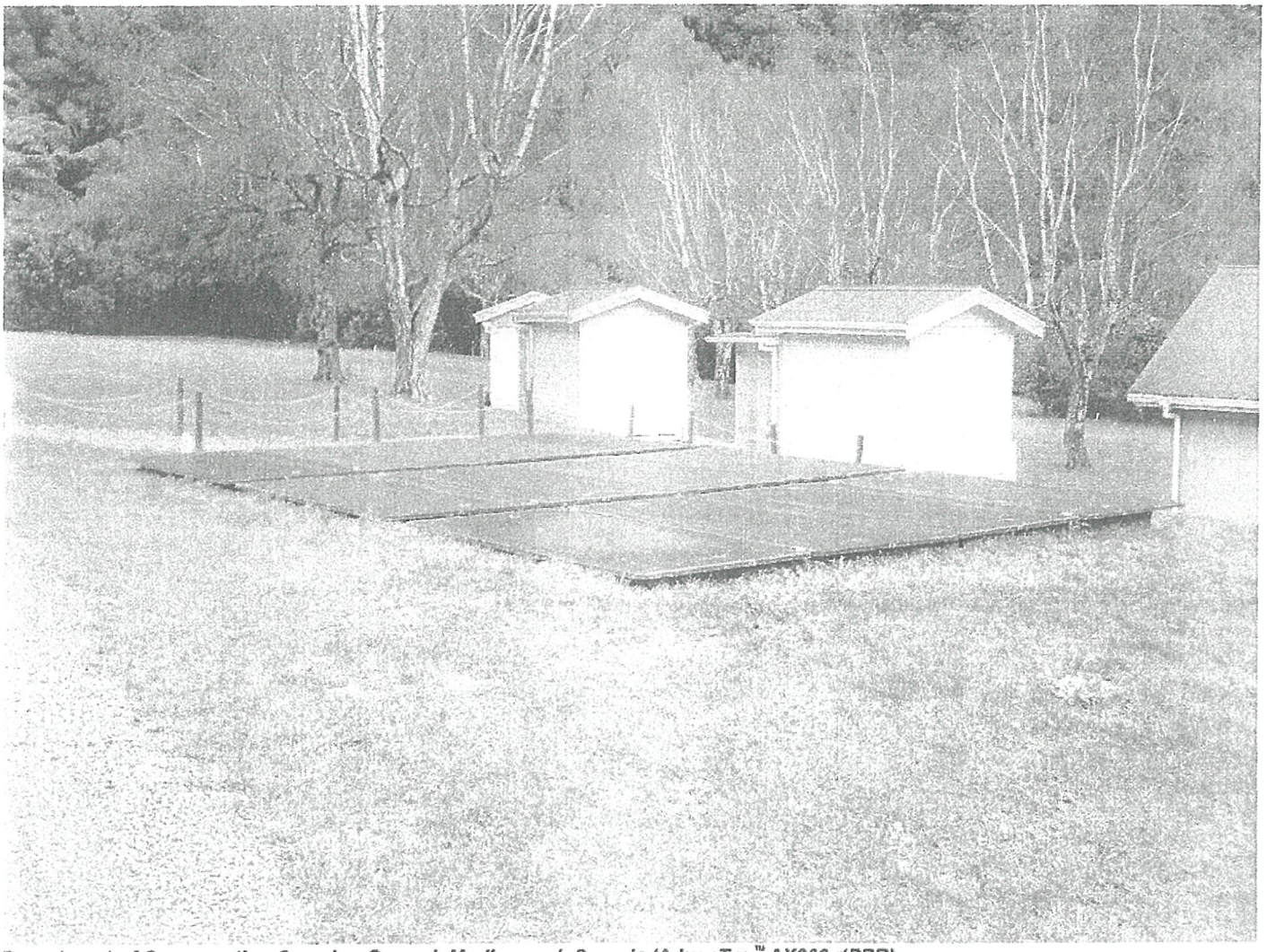
Date:	Amendments
14/6/04	version 2 layout
28/9/04	extended irrigation field
10/7/04	version 3 layout

Checked:	
Drawn:	PM
Date:	28/9/04
Scale:	1/2000 AT A3

Project: 3693
Sheet

INNOFLOW TECHNOLOGIES LIMITED
INNOVATIVE WASTEWATER MANAGEMENT SOLUTIONS

PROPOSAL
FOR
WASTEWATER COLLECTION & MANAGEMENT SYSTEM



Department of Conservation Camping Ground, Marlborough Sounds (AdvanTex™ AX300 rtPBR)

Project Name	*: Zane Grey Resort*
Project Reference	*: Q3500*
Prepared for	*: Richardson Stevens Consultants (1996) Ltd*
Date	*:8th October 2004*

SYSTEM DESIGN PARAMETERS

Wastewater Strength

Facility Description	Restaurant, Island Resort, Camping Facilities, Public Toilets
Nature of Wastewater	100% domestic, no industrial waste.
Influent Parameters	BOD < 450 mg/ltr SS < 400 mg/ltr Grease < 30 mg/ltr

Design Flow

The design flow is based on the following information supplied by Richardson Stevens Consultants (1996) Ltd:

Source	Occupancy	Design Flow Allowance (litres/person/day)	Design Flow (litres/day)
Proposed Chalets and Houses	96	120	11,520
Existing Relocated Cabins	80	120	9,600
Day Visitors	1000	25	25,000
		SUB TOTAL	46,120
Total Design Wastewater Production			**46,200 litres/day**

Expected Treatment Level

The plant is expected to consistently meet the following treatment levels:

TSS:	<20 mg/ltr
BOD_5:	<20 mg/ltr

Treatment Plant Size

The Orenco Systems Inc. AdvanTex™ packed bed reactor treatment system is to comprise the following tank and media bed sizes, excluding pump stations and grease traps.

Total Design Flow	Septic Tank Volume	Recirculation Tank Volume	Textile Media Bed Area	Treated Effluent Tank Volume
46.2 m^3/day	4 x 27 m^3	2 x 23 m^3	40 m^2	46 m^3

Land Application Area Requirements

The land application area required is based on the following required loading rates:

Design Flow	Application Method	Loading Rate	Land Treatment Area
46.2 m^3/day	Raam Pressure Compensating Dripline	5 ltr/m^2/day	9,240 m^2

The land application area is to include a 60 % reserve area.

WASTEWATER MANAGEMENT SYSTEM

Process Selection

Due to the complex nature of restaurant, public toilet and camping ground wastewater, there are a number of factors that must be taken into account when designing a wastewater management system. It is important to identify a treatment process that meets with all the criteria that have been identified. This project has the following factors to consider:

- Public health considerations
- End use of effluent
- Land use – aesthetic issues
- Available area
- Varying flows
- Stability of treatment process
- Ongoing cost to client
- Ease of operation
- Cultural requirements

Taking the above considerations and applying them against the various types of treatment processes that are available, we have been able to identify the treatment process most suited to this project. By assigning a value (weighted attribute) to each type of treatment process under the various criteria chosen, the process with the best score is identified as the most suitable for this project. The following table summarises this method.

The three types of treatment process available for this type of project are:

1. Rotating Biological Contactor (RBC)
2. Aerated Wastewater Treatment System (AWTS)
3. Recirculating Packed Bed Reactor (rPBR)

Weighted Attribute Table

Criteria	RBC	AWTS	rPBR
Land Use (amenity value)	4	3	4
Treatment levels	3	3	5
Nitrogen removal	3	2	4
Process stability	4	1	5
Sludge production	2	2	3
Power consumption	2	1	4
Operator input	3	1	5
Odour potential	3	3	5
	24	**16**	**35**

Scores are from 1 – 5, with 1 being *not good* and 5 being *very good*.

The results of this table indicate that a Recirculating Packed Bed Reactor system is most suited for this application.

The following information pertains to recirculating packed bed reactor (rPBR) technology in general and focuses on the textile (rtPBR) option for this project.

TREATMENT PROCESS OVERVIEW

We would recommend the following treatment process of each system:

Restaurant and Facilities

We recommend decommissioning the existing treatment plant and converting suitable existing tanks at their current location to **grease traps** to service the restaurant kitchen wastewater (the cost of decommissioning any existing wastewater infrastructure has not be allowed for in our proposal). Only kitchen wastewater shall be discharged to the grease traps. If the existing treatment tanks are to be decommissioned and it is not possible to reuse these tanks, then new tanks should be installed as close to the restaurant kitchen as possible. These tanks should be multi chambered and be sized on a minimum of 5 days retention time for kitchen wastewater production at peak daily flows.

In order to improve the performance of the system and to reduce wastewater strength from the restaurant it is recommended that kitchen waste is discharged through a **grease converter** (such as those marketed by Dux Industries Ltd).

As required the discharge from the outlet of the grease traps and other wastewater from toilets, etc, would then enter a **new 3 m³ pumped wet well**. This wet well will be fitted with a single vortex submersible pump and set to pump on demand to the treatment plant septic tanks via an above ground rising main. A control panel would be installed adjacent to this well and contain an audio-visual alarm.

Backpackers Accommodation

We propose that all wastewater generated from this facility is discharged into a **new 3 m³ pumped wet well**. This wet well will be fitted with a single vortex submersible pump and set to pump on demand to the treatment plant septic tanks via an above ground rising main. A control panel would be installed adjacent to this well and contain an audio-visual alarm.

All Other Chalets and Units

All other wastewater generated from the various buildings and accommodation facilities will be pumped to the treatment plant via **six new 1 m³ wet wells**. These wet well will be distributed around the site as specified by Richardson Stevens Consultants (1996) Ltd.

The configuration, panel and rising main requirements will be as outlined above.

Communal Treatment Plant

All raw wastewater from the various pumped wet wells will be discharged into **4 new 27 m³ septic tanks** located at the wastewater treatment plant site. It is proposed to construct onsite or freight to site these tanks and install above ground. Topsoil would need to be cleared and a suitable founding aggregate laid.

The combined volume from these tanks will be in the order of 2.3 days retention time at peak wastewater production. Each tank will be connected by an interconnecting pipe 450 mm from the base of the tanks. The final tank in series will be fitted with an Orenco Systems Biotube® effluent filter designed to screen out and retain in the tank suspended solids greater than 3 mm in diameter.

All access points into the tanks will be watertight and sealed with fibreglass lids and tamper proof fastening. Activated carbon vents would be installed to mitigate against the potential for offensive odours.

We propose that primary treated effluent from the septic tanks will enter **two new 23 m³ recirculation tanks**. These tanks will be fitted with two Orenco Systems Inc. (OSI) PVU84-36 screened pump vaults. Timer controls controlling the OSI pumps will provide controlled doses to an **Advantex™ AX400 recirculating textile packed bed reactor** (rtPBR). A minimum recirculating ratio of 4:1 will be maintained during peak flows.

The treated effluent exiting the packed bed reactor is to gravity feed through a recirculating spitter valve located in the recirculation tank to **two new 23 m^3 treated effluent tanks**.

We have allowed for these 4 treatment plant tanks (2 x recirculation tanks and 2 x treated effluent tanks) to be installed below ground to provide fall back from the textile pods. These tanks may be installed above ground as proposed for the septic tanks, however, it must be remembered that the four AdvanTex™ textile pods must be at an elevation higher than the top of the recirculation and treated effluent tanks. If these tanks are also to be above ground, it would be necessary to construct a steel framing structure (or similar support) to raise and support the pods to a level of about 3.5 – 4.0 m above the base of the tanks. Additional works may also be needed to support pipework, etc. *Please note our pricing assumes these tanks will be buried and covered with 450 – 900 mm of soil.*

The treatment plant pumps, floats and discharge water meter would be remotely monitored via telephone connection as discussed further in the proposal.

Communal Land Application System

Final renovation and dispersal of the treated effluent is achieved by timer dosing to a **two zone four sector 9,240 m^2 pressure compensating drip line irrigation system** loaded at no more than 5 mm/day.

The rising main from the treatment plant to the land application system is to be laid on the ground surface.

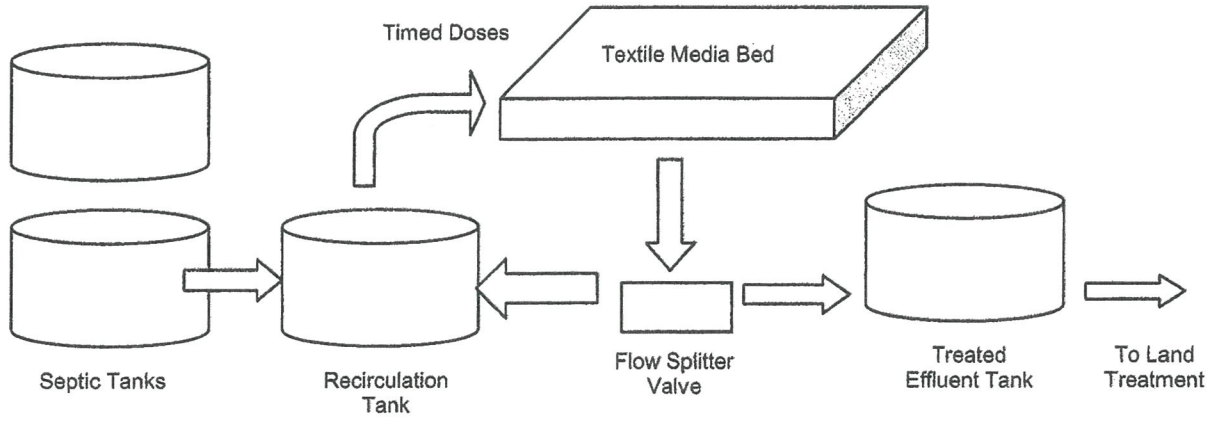
WASTEWATER TREATMENT PLANT

All wastewater from the facilities is collected and treated to a high quality using an on-site treatment plant. The type of treatment plant proposed is a recirculating textile packed bed reactor (rtPBR). This design is well proven throughout the world and New Zealand especially for the type of project proposed. The modular nature of the system makes it ideal for staged or future potential development.

This standard design features the use of equipment specifically designed to optimise the system's treatment performance and stability and minimise its operation and maintenance requirements. A schedule of the simple operation and preventative maintenance tasks is included in the full management plan provided with every system.

Treatment Process Summary

Fig 1. Schematic of Recirculating Textile Packed Bed Reactor Treatment Plant



Flow Train Schematic

Grease Removal

Grease removal is a very important process in the system and must be provided for where wastewater is generated from the restaurant or any other source likely to contain high volumes of fats, oils and grease. As discussed above we recommend that some of the existing tankage currently used at the existing treatment plant should be converted into grease traps.

The large volume grease trap is required to ensure fats, oil and grease are cooled and retained within the trap. Transportation of fats and grease to the downstream components can lead to premature clogging of Biotube® effluent filters and higher maintenance requirements.

Pump Wet Wells

Small pump wet wells are proposed (by yourselves) to avoid extensive excavations at the site and the potential to disturb culturally important sites. The pump wet wells proposed are to be between 1,000 litres and 3,000 litres depending on the facility serviced. It is proposed to install a submersible vortex pump in each wet well. Vortex pumps are recommended over macerating/grinder pumps as they transfer the solids in a way that minimises the generation of suspended solids.

Septic Tanks

We utilise the septic tank in virtually all of our designs for primary treatment. It is an inexpensive passive process requiring no energy input. We have optimised its design based on empirical data obtained from over 25 years of study on thousands of tanks, and enhanced its performance with the installation of our Biotube™ effluent filter

To ensure that the septic tank efficiently removes solids from the wastewater stream it shall have the following properties:

(a) be watertight, including access risers
(b) have sufficient sludge storage and settling volume
(c) contain a flow-modulating Biotube™ effluent filter to enhance solids reduction

The Screened Vault Filter technology dramatically reduces the total suspended solids (TSS) exiting the tank (average 30ppm TSS) as well as protecting the down-line components. Effluent from the relatively clear zone of each tank, between the scum and sludge layers, enters the filter housing through influent holes to an annular space between the housing and a computer designed non-clog mesh screen. Particles larger than 3 mm are screened out and retained for further treatment (in fact biological growths on the screen filter out even smaller particles).

The septic tank and equipment are designed to be low maintenance and should require no on-site intervention. The effluent filters are very low maintenance, having a large surface area. The septic tank will require desludging periodically, typically between every 5-10 years depending on loading

Recirculation Tank

Screened effluent from the septic tanks is received in a recirculation tank from where the dosing of the packed bed reactor is timer controlled and flow equalised utilising submersible pumps each fitted inside a screened pump vault. A small reliable turbine pump is proposed to minimise operating and maintenance costs. The pump vault houses the pumping assembly and is designed to ensure that no gross solids are pumped onto the rPBR. Float level switches installed inside the pump vault control and override the timer for high water on, and alarm in the unlikely event of timer failure. By utilising timer controlled dosing we are able to buffer incoming and recycle flows, and uniformly apply effluent to the packed bed reactor.

The patented OSI recirculation/splitter float valve assembly ensures that the optimal recycle ratio is maintained at all times, maximising treatment efficiency for a consistently high quality effluent.

The recirculation tank ensures that the packed bed reactor receives a continuous source of oxygen and food during periods of little or no flow, ensuring that the micro-organisms are maintained at peak condition, ready to receive shock or varying loads.

Recirculating Textile Packed Bed Reactor

Our parent company OSI's dedication to research and development have further refined and optimised the rPBR processes to produce a design that is unsurpassed for efficiency, reliability, future expansion capabilities, and low maintenance requirements.

The sand and pebble aggregates used in sand contactor rPBR's has been replaced by an internationally patented textile media that can accept a loading rate up to 8 times higher than the recirculating sand contactor. This produces a reactor basin with a footprint only a fraction of the size of the conventional sand contactor requirements.

The Textile rPBR (rtPBR) is essentially a bed of highly specialised textile nestled in a pre-made PODs to which the effluent is uniformly dosed through a pressure distribution system using a timer controlled dosing regime. These small precise doses at multiple point sources across the reactor bed ensure thin film application of the effluent maximising retention times within the reactor for renovation.

This unique complex fibre structure of the textile media has an immense surface area for biomass colonisation, (up to 5 times greater than sand) and a much greater void space (~3 times higher than sand) to ensure free flow of oxygen through the media interstices. Its high field moisture capacity ensures long, intimate, contact times of the wastewater with the biomass for almost complete renovation.

The rtPBR is completely enclosed with green textured fibreglass lids and is installed either above ground and bunded or level with the ground. This means that the entire treatment plant is below ground with very low visual impact.

rPBR Features and Benefits

The packed bed reactor treatment process proposed is well suited to this application because:

- it is reliable and robust
- it is cost effective both in terms of capital investment and running costs
- it consistently produces a high quality of effluent under varying loads and conditions
- it has simple operational and management requirements
- it has a successful track record in similar applications both in New Zealand and world-wide
- It has virtually no impact on the development within which it is used.

Treatment Performance

Performance data from overseas and locally indicate that an effluent quality of <20 ppm BOD_5 and <20 ppm TSS can consistently be expected.

Most effluent analyses were undertaken by Allan Aspell, Analytical Chemists, Scientific Consultants of Albany, Auckland New Zealand (More comprehensive data is available on request).

Treated Effluent Storage Tank

We propose gravity feed of the treated effluent to a 45 m^3 discharge tank. A submersible pump will be installed in this tank to provide timer controlled pressure dosing to the land application area. Float level switches installed inside the tank control and override the timer for high water on, low water off, and alarm in the unlikely event of timer failure. By utilising timer control we can optimise the application to the land application system. This tank will provide 24 hours emergency storage (in conjunction with the Recirculation Tank) above the high level alarm in the unlikely event of pump failure.

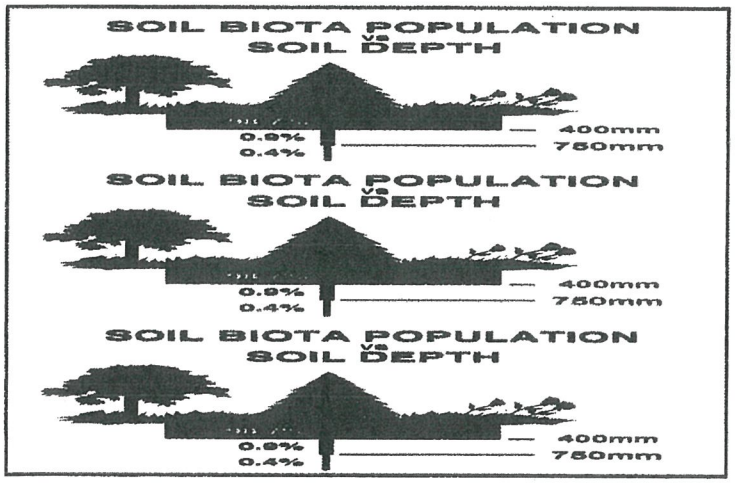
IRRIGATION DISPERSAL SYSTEM

Most applications utilise pressure compensating drip irrigation for final land treatment. This method of dispersal offers a unique flexibility allowing installation in areas of least value, such as landscaped areas, or hillside slopes. It provides minimum environmental impact and is in line with the philosophy of the Tangata Whenua whereby the highly treated effluent is returned to the land in a land-based treatment system.

Land Treatment Process Summary

The use of trickle irrigation within the "A" soil horizon maximises the potential for evapo-transpiration in addition to ground soakage. The growth of the plants in the area will be promoted with the application of water and nutrients. The application of the treated effluent directly into the biologically active topsoil layer ensures that complete treatment of the effluent occurs.

The effluent will be applied to the irrigation area at a loading rate of 5 litres/m^2/day. See for example, *Wastewater Quality and Trench System Design Effects on Soil Acceptance Rates* in On-Site Wastewater Treatment (1998), which provides evidence for increased soil acceptance rates for PBR effluent. In this paper they conclude that "soil acceptance rates through the bottom of trenches are 7 to 12 times greater for trenches receiving PBR effluent than for trenches receiving septic tank effluent" in a slowly permeable clay loam soil.



In combination with the treatment proposed, trickle irrigation offers a reliable, cost-effective, low-impact and low-maintenance effluent dispersal system.

The effluent from the main treatment plant is collected in a treated effluent tank and this is pumped to the land application area. The effluent is dispersed in a series of irrigation lines laid on the surface throughout the dispersal area installed on a 1m x 0.6m grid. TNL valves and air release valves must be installed at appropriate points in the system. A manual flushing valve should be fitted to the end of each drip line. The end of each line should be marked with either stakes or valve boxes for easy location during maintenance.

Final polishing of the effluent and natural nutrient removal occurs as the effluent is utilised by plants or soaks in to the ground.

Dispersal Area Land Requirements

Utilising a 5 litres/m^2/day (5 mm/day) application rate an area of 9,240 m^2 is required for a land application area. In accordance with Council requirements, the land treatment areas should be selected to ensure adequate (>15 m) separation from surface waters and a minimum clearance to groundwater of 600-900 mm.

Long Term Acceptance Rate of Irrigation Field

The effluent from the packed bed reactor system is treated to an enhanced secondary level and has quite different properties and environmental effects compared to wastewater that has received primary (septic tank) treatment only. Specifically, whereas application of septic tank effluent to the ground will result in long-term clogging of the soil, application of the highly treated packed bed reactor effluent will produce no reduction in soakage capacity of the soil even in the long-term. In fact overseas and local experience supports Bernhart's work (1973), which indicates that the application of highly aerobic effluent low in suspended solids and BOD_5 will *enhance* the long-term acceptance rate of the receiving soils.

The totally different environmental properties of the PBR effluent is further evidenced by the fact that in the state of Winsconsin (USA) failed septic irrigation fields are renovated by the application of aerobic packed bed reactor effluent. (Converse & Tyler 1995).

CONTROL PANEL

A fibreglass enclosed electrical panel to control the pumps is supplied with each system. The panel will contain a microprocessor-based controller, current limiting circuit breakers with thermal magnetic tripping characteristics, timer controls, manual off/automatic control switches, audible and visual alarms, and run/fault indication. As previously mentioned a timer override, and high level alarm float control are also provided. All internal system wiring is included in this proposal.

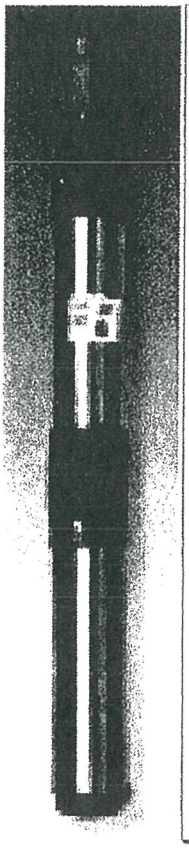
Remote Monitor Manage Control Panel

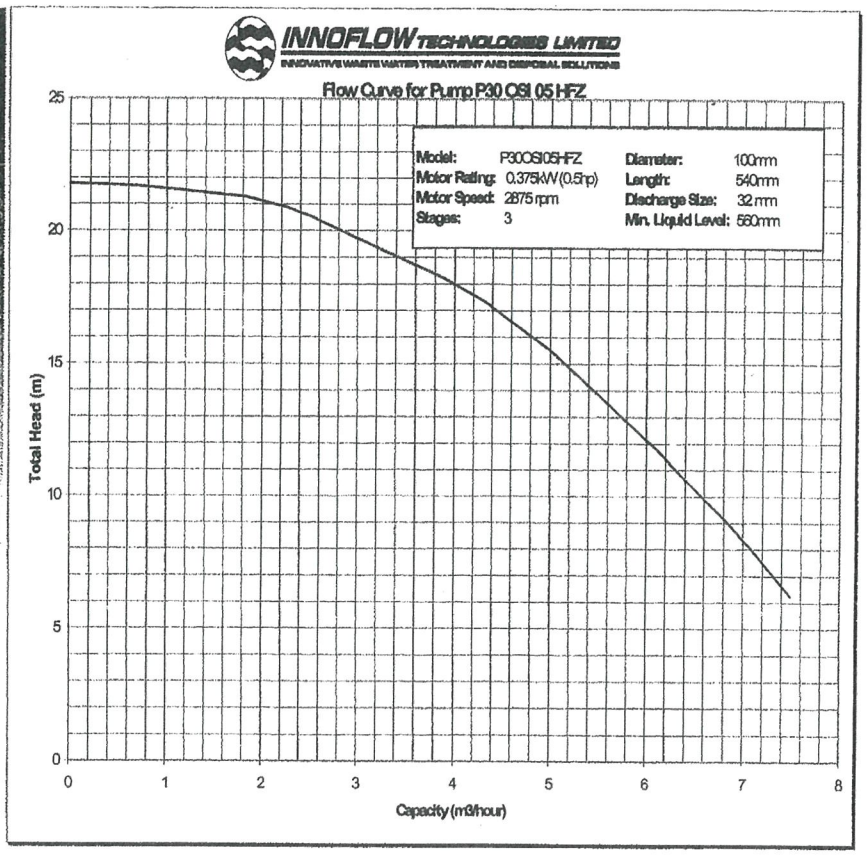
Much of the monitoring and control of the wastewater treatment plant will be done remotely using telemetry features built into the programmable control panel. The microprocessor-based controller in the panel integrates with standard control panel components (motor contactors, etc.) and provides digital and analogue sensor inputs as well as a two-way dialup function via a modem. This means that the Service Company can receive remote alarm callouts. For example a high level alarm could trigger the system to call Innoflow's office, or a pager. The system can then be checked remotely from the office to simplify troubleshooting, and facilitate accurate analysis.

System elements can also be controlled remotely (e.g. pumps turned on/off) allowing quick response and early preventative maintenance. This could involve reprogramming the control panel remotely to by-pass a float switch until a local contractor can be sent out to attend the situation. Standard logging and trending of data are also possible. Any type of event log can be captured and stored or programmed to trigger an alarm event. This includes pump run-times, high-level alarms, low-level alarms, effluent flows, pipe or orifice pressures, oxidation-reduction potential. Data can be stored for several years depending on input volume and report requirements. Reports can be viewed remotely or downloaded into common data management programmes (e.g. Microsoft Excel) for manipulation. This aids remote troubleshooting and monitoring for better maintenance and operational efficiency. **The following pricing includes Remote Monitor Manage Control at the treatment plant only.**

ORENCO PUMPS

The OSI multi-stage turbine pump used in the recirculation tank and treated effluent tank has been chosen because of its quality, long life, and extreme resistance to corrosion. Its steep performance curve characteristic is a valuable asset in prevention of orifice clogging within the rtPBR distribution system. If a few orifices begin to clog reduced flow increases pressure enough to clear clogging. When installed inside an OSI pump vault the pump carries a full *five year* warranty.





MANAGEMENT

Full training of an on site person for the operational requirements of the system is included in our proposal. However, to ensure that the system is operating to its optimal performance and to protect your investment, we recommend that our trained staff perform preventative maintenance checks for the first two years until a trends analysis can show actual service frequency requirements and the on site staff develop experience.

ELECTRICAL CONSUMPTION (AT PEAK CAPACITY)

ACTIVITY	CALCULATION	DAILY COST
Recirc Tank Pumps	19.8 kWhrs/day @ $0.14 /kWhr	$2.77/day
Treated Effluent Tanks	13.14 kWhrs/day @ $0.14 /kWhr	$1.84/day
Estimated Total Daily Cost (at peak occupancy)		$4.61/day

CAPITAL INVESTMENT COSTS - TEXTILE PACKED BED REACTOR

The capital investment for the supply, delivery and installation of a wastewater treatment and land application system as described above is summarised in the following table.

SYSTEM	DESCRIPTION	COST
Grease Traps	**Upgrade of Existing Tanks (assumes existing tanks remain)** Watertight lockable access risers and lids Carbon filter vent	**$5,700.00**
Pumped Wet Wells	**Wet Wells** 2 x 3,000 litre Wet Wells 6 x 1,000 litre Wet Wells Vortex Pumps Control Panels 50 mm OD Greenline polyethylene effluent sewer (500 m) strapped to the underside of proposed boardwalks	**$53,600.00**
Septic Pump Tanks	**Septic Tanks** 4 x 27,000 litres septic tanks (above ground) Watertight lockable access risers and lids Carbon filter vent Biotube® Effluent Filter	**$30,200.00**
Treatment Plant	**Recirculation Tank and Equipment** Recirculation tank (2 x 23,000 litres) below ground Watertight lockable access risers Patented flow splitter valve Biotube® screened pump vault Triple float switch assembly High-head turbine pump Automatic hydraulic sequencing valve **Packed Media Bed and Associated Equipment (4 x AX100 PODS)** 4 x Advantex Textile Packed Bed Reactor Treatment PODS Distribution and flushing assembly Underdrain collection system and ventilation system **Remote Telemetry Control Panel**	**$142,400.00**
Treated Effluent Pump Station	**Treated Effluent Tanks and Equipment** Treated effluent tank (2 x 23,000 litres) below ground Watertight lockable access risers Triple float switch assembly High-head turbine pump 400 m of Pressure mainline (63mm OD greenline polyethylene) laid on ground surface to land application area	**$26,000.00**
Irrigation network	Two x four sector sequencing valves 100 m runs of pressure compensated drip irrigation line (9,240m^2) pinned and laid on the ground surface. Vacuum breakers All fittings for irrigation laterals TNL control valves Flushing assemblies	**$37,500.00**
Electrical Hookup	Electrical hookup of all pumps and floats to electrical control panels.	**$2,600.00**
Travel Expenses	Mileage, digger transport, miscellaneous freight.	**$4,200.00**
Miscellaneous	Expenses, management plans (x3), signage for plant, as built plans, commissioning.	**$4,200.00**
	TOTAL INVESTMENT	**$306,400.00**

The prices given above are for budgeting purposes only

This quotation remains valid for a period of 8 weeks from the above date.

Innoflow Technologies Ltd excludes the following items in the above prices: -

- Goods and services tax
- Permits and consents
- Power supply and connection of power supply to the control panels
- Telecom connection (Remote Telemetry Unit)
- Freight from Opua Ferry Terminal to the Island
- Modified access or spoils removal if required
- Additional structures to raise AX100 pods (if treatment plant tanks are installed on the ground surface)
- Landscaping and planting
- Drainlaying from buildings to grease traps and wet wells
- New grease traps if required
- Dewatering if required
- Storm or ground water control if required

OPERATION AND MAINTENANCE

FUNCTION	WEEKLY	3 MONTHLY	12 MONTHLY
GENERAL			
Visual Inspect Plant For Obvious Faults	✓		
Record Water Discharge	As Per Resource Consent Conditions		(Daily by RTU)
Forward Reports and Meter Readings to Local Authority	As Per Resource Consent Conditions		
SEPTIC TANKS			
Measure and Record Sludge & Scum Levels in Septic Tanks			✓
Clean Biotube Effluent Filter	As Per Site Tests – Service Report Recommendations		
Recommend De-sludge Septic Tanks	As Per Site Tests – Service Report Recommendations		
RECIRCULATION TANK			
Inspect and Clean Recirculation Tank SPV Filter		✓	
Check and Adjust Operation of Recirc Splitter Valve Float		✓	
Record Operating Pressure of Recirc Pumps		✓	
Check Operation Recirc Tank Control Floats		✓	
Check Operation of Recirc Tank Pumps and Alarms		✓	
Inspect Sludge Level in Recirc Tanks		✓	
PACKED BED REACTOR			
Check and Log Operating Pressure in PBR Laterals		✓	
Confirm Orifice Flow Rate at Two Points on PBR			✓
Flush Build-up from PBR Laterals			✓
Inspect and Clean Sequencing Valve		✓	
Remove Debris and Vegetation From PBR	As Per Site Inspection		
TREATED EFFLUENT TANK			
Check Operation of Treated Effluent Tank Pumps, Alarms and Floats		✓	
Record Operating Pressure of TET Pumps		✓	
Check Operation of Treated Effluent Tank Floats		✓	
Inspect Control Panel Operation		✓	
Inspect Sludge Level in TET Tanks			✓
LAND APPLICATION SYSTEM			
Flush Build-up from Land Application System Pipes			✓
Visually Inspect Land Application Area		✓	

We trust the above meets with your requirements and look forward to hearing from you. Should you have any queries or would like to meet to discuss any aspects of the proposal please do not hesitate to contact the undersigned.

Yours faithfully
INNOFLOW TECHNOLOGIES LTD

Brent Hawthorn
SENIOR ENGINEER – COMMERCIAL BUSINESS