Expect the best!

- **The best..** appearance.
- **The best..** all round performance.
- **The best..** materials and equipment.
- **The best..** safety features.
- **The best..** range of options.
- **The best..** value.

Designed and built for
New Zealand conditions
by...

KiwiTreat Ltd

Phone: 03 3125787
Fax: 03 3125780
email: john@kiwitreat.co.nz

www.kiwitreat.co.nz

KiwiTreat

Eco Treatment System

For

Domestic Wastewater

Designed And Built
In New Zealand
For
Local Conditions.

The System....

The **KiwiTreat Eco Treatment System** is innovative and simple in design and operation.

It is recognized that at certain times of each day the system will receive higher loadings of wastewater, and the Eco treatment system can be programmed to handle these loadings.

This process ensures that wastewater passing through the system receives an adequate level of treatment in a very cost effective manner.

There is no similar product in New Zealand that is capable of matching this level of performance.

This system includes two injection molded polypropylene Everhard septic tanks. These are lightweight, yet extremely strong and durable, and are accredited with the Australian/New Zealand Standard AS/NZS 1546.1,1998.

The first tank which performs the anaerobic treatment, includes a partition and bio-filter, to enhance the pretreatment of the wastewater before reaching the aeration tank.

The aeration tank includes a large growth media pack to assist in the multiplication of the bacteria essential for the treatment, a large clarifier to assist in the removal of suspended solids, a separate pump chamber and an extremely effective air injection system

The first stage of the system is a simple, reliable, submersed pump, which extracts the liquid from the aeration tank, and delivers it to the air injector. With no moving parts to break or wear out, these dependable injectors use the venturi principle to infuse the water with air. Under pressure, the air breaks into a fine dispersion of micro bubbles, which are carried to the bottom of the aeration tank and aggressively distributed by the custom designed manifold. The liquids own natural head pressure is utilised to promote dissolving of oxygen.

The Success Story....

In 1997 it was recognised that a range of sewage systems were needed that would work reliably in *New Zealand environmental conditions.*

Technological advances together with industry recognised parameters for aerated treatment were sourced around the world, and built into several prototype plants.
These prototypes were tested extensively in all year round environmental conditions. The results were a spectacular success, and the **KiwiTreat** wastewater treatment systems evolve from continuing research and development.

The **KiwiTreat Eco Treatment System** is the latest addition to our product range, and we believe that this system is the very best option available for the treatment of domestic wastewater .

Disposal is via a non drain pressure compensated effluent drip line through a non return valve. The drip line is protected by a high capacity filter combination. The impact on the disposal field is minimal. The small quantities of well treated discharge over a long period of time allow for better and safer soil infiltration. This discharge is suitable to supplement irrigation.

A visual and audible alarm with muting facility activates if processing problem occurs.

Why use a multi-tank system?

Each treatment stage is correctly sized, as there is no restriction on the size available as can be the case with single tank systems. The system is built with long term performance being the prime objective.

Treatment processes cannot be short circuited in multi tank systems.

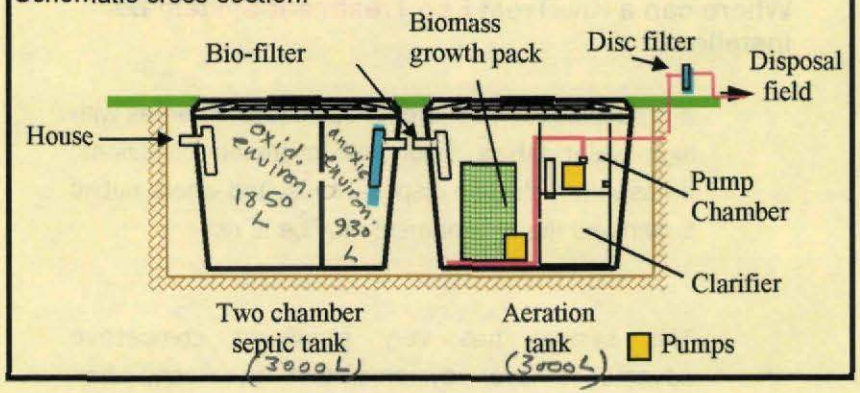
Anaerobic and aerobic conditions are kept completely separate, greatly enhancing the treatment process.

Aeration Made Efficient, Effective, and Economical.

The **KiwiTreat** air injection system makes perfect sense. Unlike inefficient compressed air methods which expend a great deal of energy forcing air into the liquid, the **KiwiTreat** air injection system extracts the liquid to be treated, pressurizes it, infuses it with air, and returns it to the bottom of the tank. All with significantly less energy, no maintenance requirements and at a much lower operating cost.

KiwiTreat Eco Treatment System

Schematic cross-section.



The materials and equipment....

The large polypropylene septic tanks are injection molded to guarantee consistent quality and strength.

The pumps are specifically designed to handle all the processes involved.

All components are made from either durable plastics or stainless steel, preventing any possibility of corrosion.

The system is built to the AS/NZS 1546.3.2001 Standard, coupled with an excellent backup service.

Transportation...

The tanks can transported on a tandem trailer.

Measurements of each tank:

Height:	1900mm
Diameter:	1800mm
Weight:	The complete system including dripline weighs 320kgs.

Where can a KiwiTreat Eco Treatment System be installed?

It is suitable for most areas, but is ideal in areas with high water tables, poor soil infiltration conditions, areas with restrictive disposal sites, and where public health and the environment may be at risk.

This system has very significant competitive advantages over systems that use sand bed filtration, and most of the aeration systems available.

The Eco system meets the requirements of AS/NZS 1547:2000 On-site domestic-wastewater management.

The Appearance...

The visual impact is minimal. The tanks are buried up to the lids. The alarm is positioned at the aeration tank, or back at the house.

What are the aeration advantages of a KiwiTreat Eco Treatment System?

The system has the ability to match the aeration requirement to the influent.

This gives the following advantages:

a. Reduced starvation of bacteria.
b. Low energy requirements at times of lower wastewater inputs.
c. The aeration process does not operate continuously, therefore greatly reduces the maintenance requirements of the mechanical components.

The KiwiTreat Eco Treatment System has a very low energy requirement. The energy requirement is typically less than that of aeration systems using air blowers. Running costs are substantially less.

Maximum aeration and agitation efficiencies are obtained through a specially designed air injection and output sparge pipes.

There are two pumps, one for timer aeration, and the other to pump out the system on a float system. Noise levels are not an issue, as no mechanical items are located on top of the tanks.

PRODUCER STATEMENT - FOR 2 Pump System

KiwiTreat.

A Sewage Treatment Plant For Domestic Sites.

Technical Description.

Purpose and Scope.

To provide a sewage treatment plant of the extended aeration activated sludge type suitable for up to ten equivalent persons, which produces treated wastewater of suitable quality for use above and below ground, as per the requirements of the Regulatory Authorities.

The system is designed to:

1. Be user friendly.
2. Have low maintenance and service requirements.
3. Be very reliable in operation and performance.
4. Match the site requirements through its modular components to function under viable conditions.
5. Be acceptable in areas of environmental and conservation interest.

The system is designed to give continuous peace of mind performance.

Wastewater Characteristics.

Hydraulic Load.

The wastewater volume generated by a household has been calculated using well-proven and documented guidelines.

Sewage flow: Average per day = 1440 litres.
(Eight equivalent persons x 180 litres each per day).
Peaking factor = 4, giving an estimated maximum loading of 240 litres per hour.

Organic Load.

The strength of the wastewater from a house is calculated in terms of grams per day of BOD_5.
The design figure utilised is 560 grams per day, and is derived from the industry-accepted figure of 70 grams of BOD_5 per person per day.

The septic tank reduces the organic load by acting as a primary sedimentation tank and an anaerobic digester. The reduction allowance is 30% of organic strength. This results in a BOD_5 to be treated by the aerobic module of 392 grams per day.

Process Description.

The sewage treatment plant is an activated sludge type, incorporating a continuous discharge, and with an in-plant surge capacity of 2100 litres.

The initial component of the plant is a septic tank that acts as a primary settling tank and solids digester.
An aeration chamber operates at a food to microorganisms' ratio of 0.05, as the chamber is fitted with a plate media pack to promote suitable biomass growth and enhance denitrification follows the septic tank. The venturi air system provides in excess of 2.4 grams of oxygen per gram of organic material to be treated.

The settled effluent in the aeration chamber is reseeded with acclimatised stable biomass. This process provides all the advantages of a step treatment system.

The treated wastewater then passes through a clarifier, to the disposal pump chamber. The liquid is then pumped through a chlorinator if disinfection is required, before passing to the disposal area.

Septic Tank.

The primary treatment is achieved by the utilisation of a septic tank upstream of the aerobic module. The septic tank is sized according to the Standard for Septic Tanks. A partitioned 3000 litre septic tank is used, with a primary chamber working volume of 1850 litres, and a secondary chamber working volume of 930 litres.
Most of the insoluble waste remains within the primary chamber. The liquid fraction and small volume solids pass through to the secondary (anoxic) chamber, where significant quantities of nitrogen and nitrogenous compounds are removed from the system. This has the effect of maintaining the pH levels of the resultant liquid within an acceptable range for the aerobic bacteria working in the downstream processes.
The addition of a filter at the discharge area of the primary tank helps to further improve the quality of the wastewater

before the aeration stage, by further reducing the the solids fraction. The filter also assists in moderating surge volumes.

Aeration Module.

The aeration module utilises second 3000 litre tank.
The aeration module is provided to allow the wastewater to come into contact with both suspended biomass and attached growth biomass. This contact and subsequent degradation of the fine particulate and soluble organic material occurs in the controlled introduction of air.
The normal aerated volume in this system is 2700 litres, with a surge capacity of 1100 litres. This surge capacity ensures a uniform discharge through the clarifier to the discharge chamber.

The aeration system has a design F/M ratio of 0.05 when taking the plate pack attached biomass into account. The above figures are well within the industry accepted extended aeration range.

Plate Pack Media.

A high surface area to volume plastic media is fitted to the aeration chamber. This media provides a suitable growth surface for stable attached growth biomass. The growth characteristics of this biomass promote good nitrification, some denitrification (with inherent stability) and good settling characteristics of the waste sludge. The media packs provide a surface area of 44m2, not including the tank and associated componentry. The total surface area for biomass growth is in excess of 61m2.

Aeration.

The aeration tank is provided with intermittent aeration for 18 hours each day. This process promotes denitrification and hence stable biomass and suitable pH in the mixed liquor of the aeration tank. In order to provide in excess of 2.4 grams of oxygen per gram of BOD_5, more than 12 litres of air per minute is provided to the system. The aeration is by means of venturi and is of the coarse bubble type. This is the chosen method of aeration for the following reasons:

1. It supplies large volumes of air in relation to the energy input.
2. It operates without creating a buildup of bacteria around the air discharge area.
3. It aerates the full depth and therefore the total volume of the liquid in the aeration chamber.
4. It has the ability to shut down at specified times for further denitrification to take place, which helps promote stable biomass and suitable pH.
5. It has the ability to increase or decrease the volumes of air as required through the timer.

The air for the venturi is sourced from outside the tank, so there is always fresh air available for the process.

Clarifier.

A proprietary 450-litre clarifier is installed in the aeration chamber for the purpose of removing additional suspended solids that could pose a problem for the disposal system. The clarifier also controls surging to ensure that the wastewater is properly treated before further downstream processing.

Disinfection.

Disinfection if required is normally by chlorination, which takes place after the pump out chamber. The chlorinator remains effective by means of chlorine tablets moving down a magazine system into the operating area as required. There is no possibility of chlorine contamination of any of the other treatment processes, using this system.

Pump Out Chamber.

This chamber has a working volume of 155 litres per cycle

Disposal.

Disposal is normally by dripline via a non return valve. The system includes 300 metres of pressure compensated, self flushing dripline specifically manufactured for effluent disposal, and a flushing valve. The site conditions and the environmental conditions of the area govern the size of the disposal area. It is recognised that quality and the disposal of the resultant liquid are of paramount importance to all concerned.

System Monitoring.

The system is monitored by alarms situated at the control box and inside the house.
The alarms inside the house are audible and visual. A switch is provided to mute the audible alarm when heard.
The alarm at the control box is audible.
The alarms are activated if the following units malfunction:

1. The aeration pump.
2. The disposal pump.
3. A disposal line blockage.
4. The venturi system.
5. A clarifier blockage.
6. A chlorinator blockage.

Discharge Quality.

Quality of discharge is of paramount importance. The system is designed to meet the following standards.

1. Faecal coliforms – not more than 30 cfu/100 mls, if disinfected.
2. BOD5 – not greater than 20mg/litre.
3. Suspended solids – not greater than 30mg/litre.
4. Free chlorine – not less than 0.5mg/litre, if disinfection is required.

Guy Boddington-5174

From: Guy Boddington-5174
Sent: Wednesday, 8 March 2006 9:02 a.m.
To: 'Bronwen Frazer (abacusdesign@xtra.co.nz)'
Subject: U060174 Cresswell and U060173 Scoones --Anakiwa

Contacts: Bronwen Frazer

Hi Bronwen: No problems with Scoones (processible) but for Cresswell we need the make and model of 2ndary treat unit and confirmation via a spec sheet that it is capable of treating 1080 litres/day. Get back to me with this and will proceed.
Guy

ABACUS DESIGN

ARCHITECTS PROJECT MANAGERS ENGINEERS

Site and Soil Evaluation Report

1.0 SITE INFOMATION

1.1 Location details:

Owner: Marlene Cresswell

Location: 353 Anakiwa Road

Address: RD1 Picton

1.2 Site Description:

1.3

A site plan is attached for reference.
The site covers 1018m^2 and is located in Anakiwa on the northern side of Anakiwa Road. The site features an existing 2 bedroom dwelling and a garage. The site is generally flat with a small amount of cross fall to the east. The site is vegetated with lawn and gardens at present. The dwelling is currently serviced by a 3500L septic tank, the disposal field is unknown. Mrs. Cresswell wished to replace the existing wastewater system with a new secondary treatment plant system sized for a three bedroom dwelling. Mrs. Cresswell intends to rebuild the existing dwelling in the near future, the new dwelling will be constructed on the same footprint as the existing dwelling however it will feature three bedrooms. No water courses are located on the property.

1.3 Climate:

Annual rainfall (mm): Unknown

Annual Evaporation (mm): Unknown

1.4 Intended water supply:

Community Scheme

1.5 Existing on-site systems:

Existing system servicing the dwelling is reported to be operating satisfactorily

1.6 Site Evaluator:

Name: Bronwen Frazer

Company/agency: Abacus Design

Address: PO Box 309
Blenheim

Phone: 5778857

Fax: 5779966

2.0 ON-SITE EVALUATION

2.1 Work Undertaken:

Details: Site visit & soil testing

Date: February 2006

Weather (on day and preceding week): dry during visit some rain the night before.

Photo Attached: NO

2.2 Topography:

Slope: generally flat

Drainage Patterns: no obvious

Ground Cover: lawn and gardens

Boundaries: noted

Waterways: none in vicinity of the site

Well/Bores: none

Buildings: existing two bedroom dwelling to be replaced with a three bedroom dwelling. Existing garage.

Other: Existing garage.

Site History (land Use): dwelling in lower portion of the site.

Site Plan Attached: YES

2.3 Site Exposure:

Site Aspect: south east

2.4 Environmental concerns: (e.g. High water table, wetlands, water ways etc.):

No water bodies or ground water issues.

2.5 Site Stability:

no

2.6 Drainage Controls:

Depth to seasonal water table: in excess of 2m

Need for cut off drains/diversion banks: N/A

Need for surface water collector/cut off drains: N/A

2.7 Set back Distances:

min + 2.0m from boundaries

Reserve area: not required - secondary treatment

3.0 SOIL INVESTIGATION

3.1 Soil profile determination Method: Auger Hole
A range of soil properties have been assessed in accordance with the procedures outlined in Appendix 4.1D of NZS1547:2000

3.2 Reporting

Test Site 1

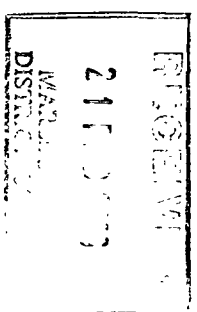
Layer	Lower Depth	Moisture content	Colour (moist)	Field Texture	Coarse Fragments %	Structure	Other
1	30mm	Dry	Light Brown	Loam	<2	Moderate	Topsoil
2	270mm	Dry	Light yellowish Brown	Clay Loam	<40	-	Clay Loam, slightly gritty, sticky moderately plastic, yellow stain. Ribbon length 35mm Contained many schist and quartz fragments ranging in size from sand to pebbles.
3	470mm	Dry	Light Orange Brown	Clay loam	>10	-	Clay Loam, slightly gritty, sticky moderately plastic, Ribbon length 40mm Contained many schist and quartz fragments ranging in size from sand to pebbles.
3	-	Dry	Light Orange Brown	Clay loam	>10	-	Clay Loam, slightly gritty, sticky moderately plastic, yellow stain. Ribbon length 40mm

Test site 2

Layer	Lower Depth	Moisture content	Colour (moist)	Field Texture	Coarse Fragments %	Structure	Other
1	100mm	Dry	Light Brown	Loam	<2	Moderate	Topsoil
2	400mm	Dry	Light yellowish Brown	Clay Loam	<40	-	Clay Loam, slightly gritty, sticky moderately plastic, yellow stain. Ribbon length 35mm Contained many schist and quartz fragments ranging in size from sand to pebbles.
3	-	Dry	Light Orange Brown	Clay loam	>10	-	Clay Loam, slightly gritty, sticky moderately plastic, Ribbon length 40mm Contained many schist and quartz fragments ranging in size from sand to pebbles.

Test Site 3

Layer	Lower Depth	Moisture content	Colour (moist)	Field Texture	Coarse Fragments %	Structure	Other
1	150mm	Dry	Light Brown	Loam	<2	Moderate	Topsoil
2	440mm	Dry	Light yellowish Brown	Clay Loam	<40	-	Clay Loam, slightly gritty, sticky moderately plastic, yellow stain. Ribbon length 35mm Contained many schist and quartz fragments ranging in size from sand to pebbles.
3	-	Dry	Light Orange Brown	Clay loam	>10	-	Light Clay , slightly gritty, sticky moderately plastic, yellow stain. Ribbon length 40mm



3.3 Estimated Soil Category:

Soil Test	1	2	3	4	5
Soil Category	4	4	4-5		

The estimated soil category has been determined based on Table 4.1.1 NZS 1547:2000 The assignment of soil category 4 is based on the texture and structure of the soil as described in 3.2 above and observations made during the site visit.

3.4 Recommended DLR / DIR

DLR: 15mm/day (secondary treated effluent)
Reason: Values based on soil category and lack of environmental risk.15mm/day for secondary treated effluent is suggested in NZ1547. Size constraints of site prevent irrigated disposal

3.5 General Comments

Shallow bed disposal of secondary treated effluent. Size constraints of site prevent irrigated disposal

4.0 DESIGN

4.1 Soil Category found on site: 4

4.2 Number of Bedrooms: 3

4.3 Average Daily Flow Rate (Q) (Litres): 1080L

Design Occupancy: up to six people
Flow Allowance: 180L per person per day.

4.4 Septic Tank Capacity (Litres): Treatment Plant

4.5 Treatment Quality Required:

Equal to or better than: 20g/m3 BOD5: 30g/m3 Total Suspended Solids

4.6 Loading Rate (DLR): 15mm/day

4.7 bed spacing (m): 2m

5.0 CALCULATIONS

$$A = \frac{1080L}{15mm/day \times 3m}$$

Disposal Area = 72 square meters
Two 12m x 3m shallow beds

6.0 Assessment of other possible systems:

Due to the size constraints of the site and the high soil category disposal of primary treated effluent is not possible. Irrigated disposal of secondary treatment is not possible due to the size constraints of the site.

7.0 Best Practical Option

The best practical option for management of domestic wastewater is through the use the proposed system (as detailed in section 4.0 above It is my opinion that this system is the best method for preventing or minimizing any adverse effects on the environment.

ABACUS DESIGN

ARCHITECTS PROJECT MANAGERS ENGINEERS

Maintenance Schedule for Septic Tank and Effluent Disposal Field

1.1 Owner detail:

Owner: Marlene Cresswell

Location: Anakiwa
Note: Owners and occupiers are legally responsible to keep their on-site system in good working order.

1.2 System Detail:

Capacity: Minimum 4000L Secondary Treatment Plant.

Disposal Field: 72m^2 two 12m x 3m shallow beds.

1.3 Use of System:

The Manufactures guidelines for correct use of the system should be followed.

1.4 Maintenance of Secondary treatment plant:

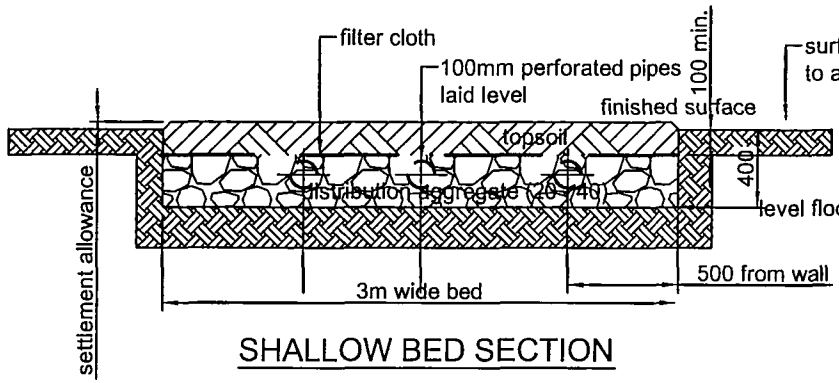
The owner shall arrange for the following Maintenance in accordance with manufactures recommendations:

- The system is required to be desluged regularly (3-5 years) or when sludge and scum occupy 2/3 of the volume of the tank At the time of desludging all components of the system shall be checked and maintained as detailed below.
- Check any operation and timer controlled control panel.
- Effluent filters shall be inspected and cleaned annually or more frequently if required.
- The pump and switches shall be checked annually to insure that both are working reliably.

1.5 Maintenance of disposal field:

- The disposal field shall be inspected for any signs of failure (wet soggy areas, sewerage smell) Should the field be found to be operating inadequately the best practical option shall be employed to rectify the problem.

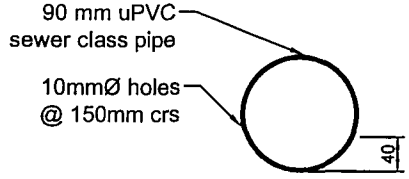
NOTE: Manufactures Instructions for maintaining and cleaning of Effluent Filters, Pumps and Switches shall be followed at all times.



SHALLOW BED SECTION

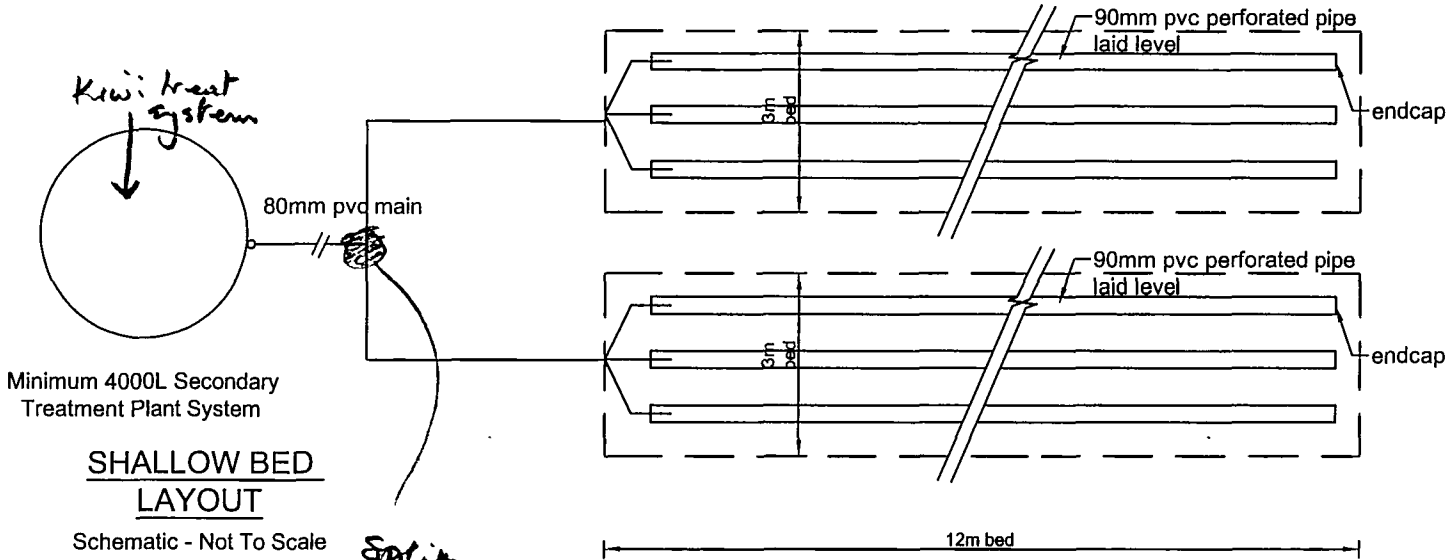
Not To Scale

(level site - slope less than 5%)



PERFORATED PIPE DETAIL

Not To Scale



SHALLOW BED LAYOUT

Schematic - Not To Scale

Splitter between beds → not manual — should be automatic

MARLBOROUGH DISTRICT COUNCIL
21 FEB

AMENDMENT	DATE	DETAILS

ISSUE
For Info

ABACUS DESIGN

PROJECT
CRESSWELL EFFLUENT
ANAKIWA

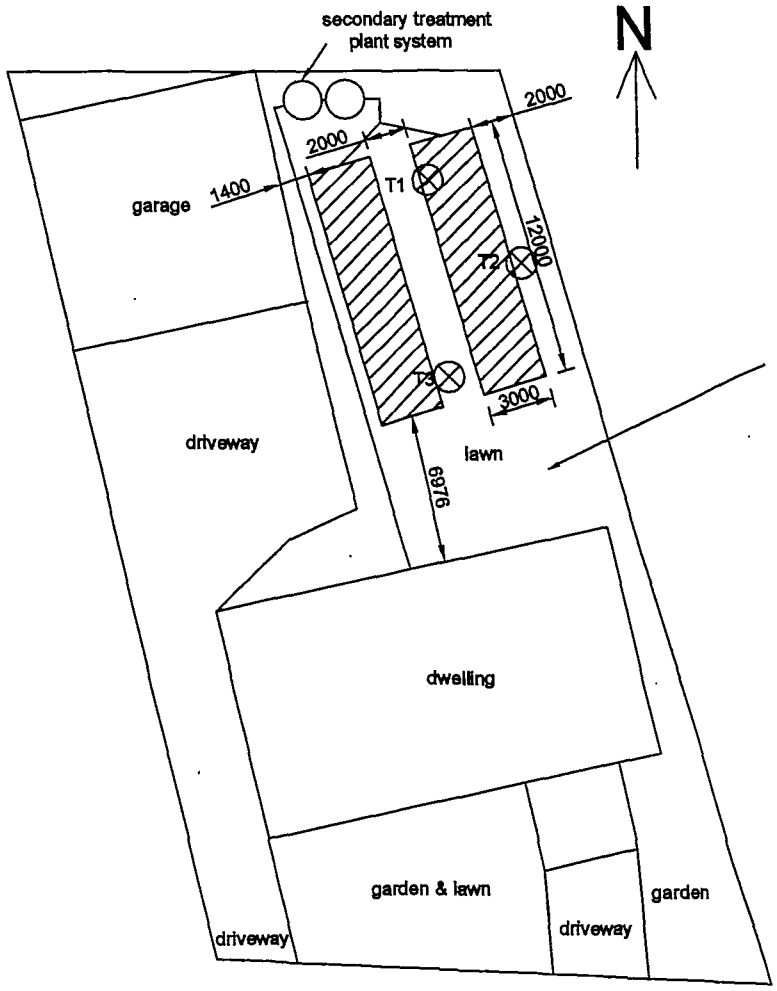
DRAWING
SHALLOW BED
EFFLUENT DISPOSAL

DATE 16/01/06
SCALE NTS

DWG NO. SJ769-Fig2
AMENDMENT 01
CAD FILE REF: SJ769-fig1

NOTES:

T1 = Subsoil test pit 1
T2 = Subsoil test pit 2
T3 = SUbsoil test pit 3



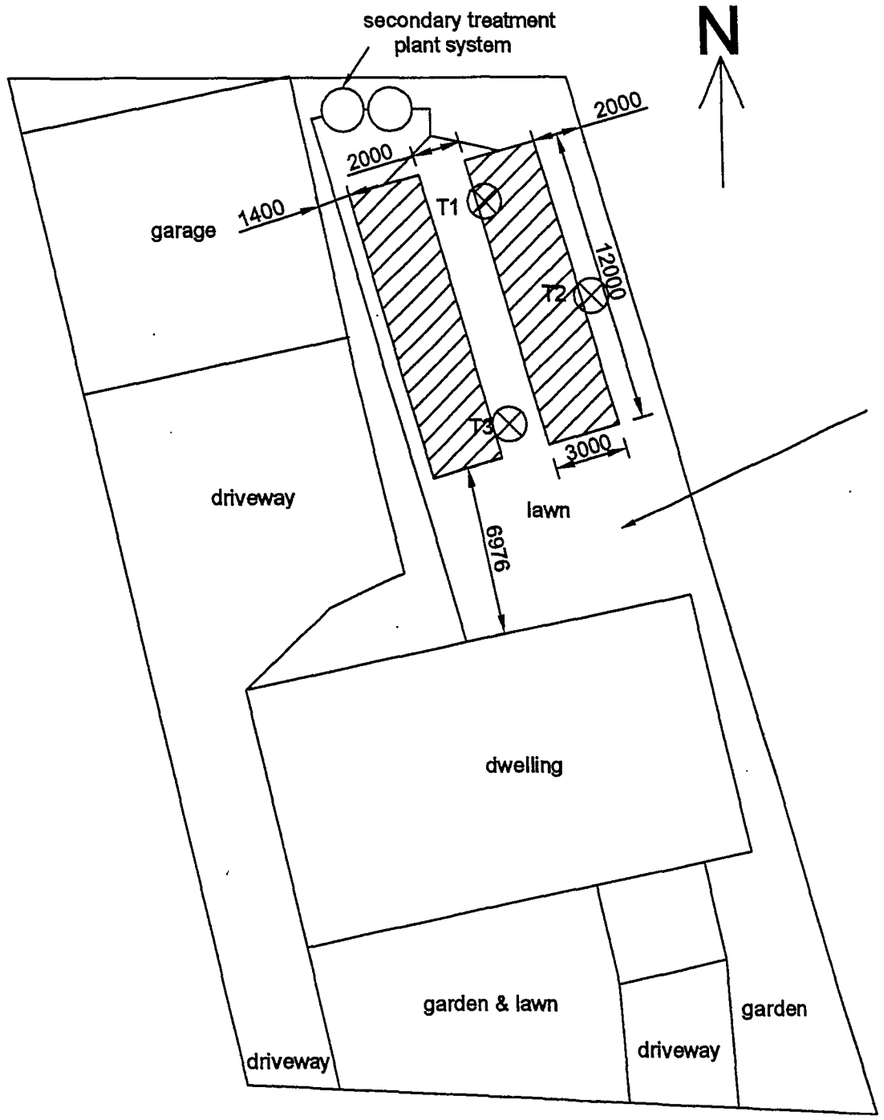
FOR INFO

01 13/02/06 FOR INFO AMENDMENT DATE DETAILS	AMENDMENT DATE DETAILS	CONSULTANTS ABACUS DESIGN abacusdesign@xtra.co.nz - TEL 03 577 8857 - FAX 03 577 9966 - PO BOX 309 - 141 HIGH STREET - BLENHEIM - NEW ZEALAND	CLIENT M CRESSWELL	PROJECT EFFLUENT DISPOSAL DRAWING SITE PLAN	DATE 13/02/06 AMENDMENT 01 DWG NO. SJ769-fig1 SCALE 1:250 CAD FILE REF: SJ769-F1	A3

060174

NOTES:

T1 = Subsoil test pit 1
T2 = Subsoil test pit 2
T3 = SUbsoil test pit 3



FOR INFO

01 13/02/06 FOR INFO AMENDMENT DATE DETAILS	AMENDMENT DATE DETAILS	CONSULTANTS ABACUS DESIGN abacusdesign@xtra.co.nz - TEL 03 577 8857 - FAX 03 577 9966 - PO BOX 309 - 141 HIGH STREET - BLENHEIM - NEW ZEALAND	CLIENT M CRESSWELL	PROJECT EFFLUENT DISPOSAL DRAWING SITE PLAN	DATE 13/02/06 AMENDMENT 01 DWG NO. SJ769-fig1 SCALE 1:250 CAD FILE REF: SJ769-F1	A3

060174