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COPY

Davidson Partners Ltd

Structural Engineering
Civil Engineering
Building Design
Project Management

Practising in association with Ayson and [illegible]

Our Ref: 23884

23 October 2007

Marlborough District Council
P O Box 443
BLENHEIM

ATTENTION: J Hughes

re: **LOCHMARA LODGE LTD, DOUBLE COVE (U020949)**

Further to our email of 11 October 2007, the purpose of this correspondence is as commentary on our investigation and assessment of the existing wastewater system. This includes a preliminary assessment of upgrade requirements and recommendations for the management of the system for the coming Christmas / New Year period.

1. General

We were contacted in July of this year by the owner with a request for assistance in assessing their system. We were provided with copies of consent documentation and test results. We also researched Council files for further information.

Following approval of fees we visited the site in conjunction with the Manager and the service contractor on the first suitable occasion. This was 5 October 2007. We spent two hours on site and viewed all parts of the treatment system including an internal inspection of all tanks and detailed discussion of the operation and control of the system.

2. Desktop Review

The site is clearly subject to extreme load variation, with very low to no use for most of the year and very high use for approximately three weeks over the Christmas / New Year period. This fact makes it difficult for any wastewater system to provide treatment to the required standard at all times.

The system is designed for 50 people at 130 litres / person / day. This loading rate is correct but extreme people numbers at the peak time could occur. The total design flow is 7,000 litres per day. No detailed flow monitoring has been undertaken to verify whether this is complied with.

ACENZ

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Principals
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The system is an aerateD wastewater treatment plant. This type of system is not renowned for its ability to provide consistently high quality treatment under substantially variable flow conditions. Clearly the system in place does not cope with the loading at this site given the non-compliant effluent quality tests undertaken during the peak season.

Council have rightly requested an independent professional review of the system given that it has not met the treated effluent quality requirements at peak times since its installation. Given the information available, we need to assess two things, being (i) what are the obvious inadequacies of the system that can be directly improved upon to improve its performance and (ii), will such improvements mean the system will meet the required standard or in fact was the wrong type of system installed and a different process needs to be put in place.

3. Site Observations

The system appeared to be in good operating condition with no smells and clear liquid in the clarification chamber. All parts of the system appeared operational although one of the aeration pipes is dislodged – the maintenance contractor did not think this is a serious issue and will attend to a repair when other upgrading / replacement work is carried out.

There were no objectionable odours from the tanks and a healthy crust on the first primary chamber. All filters are in good order and a flow meter in place. All lids were secure and unobtrusive in this location.

The control area within the adjacent building is well laid out and there is clear information on the operation of the system. The aeration has a switch to adjust the amount of aeration for high and low usage periods. The flow reading chart shows that few readings have been taken and the information is of little use other than for general trends.

There are no other tanks prior to effluent reaching the main system. There are notices at major fixtures advising people of the need to take care with what they put down the drain and several of the accommodation units do not have full bathroom facilities. There is a single washing machine; the Manager expressed a willingness to remove this if it was likely to be of significant benefit to reducing the load on the treatment system.

The only observable 'fault' with the existing system is that the high level float in the pump chamber is far too high and leaves minimal emergency storage capacity if there is a failure or extended power outage. The float must be lowered to just above the usual operating range to prompt an alarm signal at the earliest opportunity. We also noted that the small size of the pump chamber will in fact provide only a few hours reserve at peak flow which means that once the alarm goes, all users will have to virtually cease their wastewater discharge until the issue is dealt with or vacate the site.

One further matter is that the aeration chamber should contain submerged porous media to provide a large surface area for the support of biological activity therein. The contractor probed the inside of the tank and found no media present. It is not clear from information available to us how much media should have been present.

4. Preliminary Conclusions

4.1 Inflow to the System

The existing flow records do not give detailed information on the usage of the system. Such information is critical to the optimisation of the system and must be gathered. Daily readings are required over the peak season. This critical information will guide the design of the upgrade of the system including the consideration of fixture changes within buildings.

4.2 Treated Effluent Testing

Testing has been sporadic and not met the requirements of the Resource Consent. Detailed testing as per Condition 04B is appropriate and must occur until compliance over a number of seasons is demonstrated.

We however consider that, given that the discharge from the system is to land, testing for faecal coliforms to show that the UV disinfection system is performing should not be required and the UV system be decommissioned. We assume such a condition was imposed because it was volunteered by the Applicant.

4.3 Primary Treatment

The primary treatment tanks perform the valuable task of retaining solids and floatables from the waste stream but, almost as importantly, need to be of sufficient capacity to buffer peak flows to moderate disturbance within the tank and slow their progress to the next stage of the treatment process. A further consideration with aerated systems is the additional sludge production from the aeration / clarification processes which gets pumped to the primary tank.

Our preliminary assessment is that there is inadequate primary capacity in the system to achieve good initial treatment and flow buffering. It is possible that an increase of in the order of 50 to 100% of the existing capacity will be needed. This can be accurately assessed once detailed flow data is available. In the meantime, the tanks are to be cleaned out prior to the coming peak season to provide the maximum liquid volume available.

4.4 Secondary Treatment

The obvious discrepancy with the aeration part of the system is the lack of contact media. This material would support the establishment and extend the life of biological activity within the system. The placement of media is required; the best approach is considered to be to assess the optimum type and amount of media once detailed flow information is gathered. The same applies to the optimisation of the form and volume of aeration provided to the system.

4.5 Tertiary Treatment

We consider that disinfection is unnecessary given that the discharge is to land and that the UV system be decommissioned.

4.6 Pump Chamber

The Manager has been instructed to lower the alarm float to the lowest level possible. However, this still will not provide substantial reserve capacity and users of the site this summer will need to be on notice that if the wastewater systems becomes inoperative for any period of more than a few hours, then they may well have to vacate the property.

To ensure that at least 24 hours emergency storage is available at the final point of the treatment system, additional capacity of approximately 5,000 litres is required.

5. Current Recommendations

- Daily flow recording for the months of December and January, and any other time there is substantial occupancy of the site.
- Treated effluent testing in accordance with Resource Consent requirements (as a minimum).
- The Manager to advise all cabin owners in writing of the need to take care of the system and of the implications of non-operation of the system for any reason.
- Following receipt of essential peak season flow and quality information we will assess and detail upgrade requirements. These are likely to require Resource and Building Consents.

While we appreciate that Council will have wanted the system to be improved prior to this peak season, we have not been provided with enough time nor information to design and implement improvements. In our opinion the most appropriate course of action is for the system to have very detailed monitoring this summer and this information be used to improve and optimise this system or design a new system if required. Users must however be put on notice of the fragility of the existing system as described above.

DAVIDSON PARTNERS LTD

R W Davis

RWD:MH

COPY TO: Mr I Town
71 Hoon Hay Valley Road
Halswell
CHRISTCHURCH 8025

ATTN: Ian Town.

Oct 07 615

DECEMBER 2007		JANUARY 2008		FEBRUARY 2008	
Date	Reading	Date	Reading	Date	Reading
Sat 1		Tue 1	640·7	Fri 1	
Sun 2	618·66	Wed 2		Sat 2	
Mon 3	619.20	Thu 3	645.1	Sun 3	
Tue 4	619.26	Fri 4	647.1	Mon 4	
Wed 5	619.88	Sat 5	649.0	Tue 5	
Thu 6	620.69	Sun 6	650.9	Wed 6	
Fri 7	620.49	Mon 7	653.0	Thu 7	
Sat 8	621.01	Tue 8	654.3	Fri 8	
Sun 9	621.62	Wed 9	657.8	Sat 9	
Mon 10	622.33	Thu 10	659.0	Sun 10	
Tue 11	622.84	Fri 11	660.5	Mon 11	
Wed 12	—	Sat 12	662.5	Tue 12	
Thu 13	—	Sun 13	665.2	Wed 13	
Fri 14	623·55	Mon 14	667·2	Thu 14	
Sat 15	624·65	Tue 15	669.8	Fri 15	
Sun 16		Wed 16	671.1	Sat 16	
Mon 17		Thu 17	672.4	Sun 17	
Tue 18		Fri 18	674·4	Mon 18	
Wed 19		Sat 19	675·0	Tue 19	
Thu 20	625.95	Sun 20	676·9	Wed 20	
Fri 21	625·95	Mon 21	678·9	Thu 21	
Sat 22		Tue 22	680.1	Fri 22	
Sun 23		Wed 23		Sat 23	
Mon 24		Thur 24	684.4	Sun 24	
Tue 25		Fri 25	686·5	Mon 25	
Wed 26		Sat 26		Tue 26	
Thu 27	630·18	Sun 27	689·8	Wed 27	
Fri 28		Mon 28	692·4	Thur 28	
Sat 29	632	Tue 29	693·0	Fri 29	
Sun 30	635	Wed 30	694·4		
Mon 31	637·4	Thur 31	695·7		

PUMP READINGS.

ecoEng Pacific Limited
" applying science and engineering to the ecosystems we live in "

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NEW ZEALAND

5 May 2008

Ross Davis
Davidson Partners Limited
PO Box 256
Blenheim

Our File Ref.: 0033-LT01

Dear Ross,

Technical Advice on Wastewater Treatment System: Lochmara Lodge Ltd, Double Cove

ecoEng Pacific Ltd have been engaged by Davidson Partners Ltd to undertake a technical review of the condition and capacity of the Wastewater Treatment Plant (WWTP) servicing the above site. This report presents a summary of this review and provides recommendations on appropriate rectification works to ensure the WWTP can manage wastewater from the site and meet requirements of the resource consent (U020949).

The following information was provided to assist in this review.

- Report from Davidson Partners dated 23 October 2007.
- Site plan of the facility.
- Wastewater flow data for December 2007 and January 2008.
- Laboratory results for effluent sampling for December 2007 and January 2008.
- Original WWTP design report from Lets Go! Enterprises dated January 2003.
- Site photos of the WWTP from a site visit undertaken by Davidson Partners.

ecoEng Pacific have not undertaken their own site inspection or testing at this stage but are confident that our assessment and recommendations are appropriate for the site based on the information provided to us.

Wastewater Characterisation

The treatment capacity of the system has been assessed against the current consented discharge volume of 7,000 L/day with allowance made for the significant variation in wastewater loads between off-season and holiday periods. Wastewater discharge flow data was used to assess a) the current load and b) the variation between seasons. The variation between and within seasons was used to develop a predicted peak season flow rate by assuming the consented discharge volume of 7000 L/day to be the 90th % wastewater flow for the period 30th December to 31st January. It was also used to assist in design of the proposed flow balancing tank by assessing the capacity to handle shock loads while limiting discharge to 7000 L/day. The key flow criteria used in this assessment are presented in Table 1.

Table 1: Key Wastewater Flow Criteria: Lochmara Lodge WWTP

Flow Parameter (L/day)	Current Scenario		Design Occupancy = 90th% Flow		Maximum Capacity (discharge limited to 7000 L/day)	
	Shoulder[1]	Peak[2]	Shoulder	Peak	Shoulder	Peak
Minimum	0	600	0	1600	0	2400
Average	500	1930	1300	5000	2000	7700
90th%	710	2680	1840	7000	2828	10720
Peak	910	3500	2400	9100	3600	14000

Note 1: Shoulder season based on data from 3/12 to 29/12
Note 2: Peak season based on data from 30/12 to 31/12

In the absence of site specific raw wastewater quality data BOD_5/TSS are assumed to be 350 mg/L each which is typical of domestic wastewater. Target effluent quality is 20/30 mg/L BOD_5/TSS.

Assessment of Treatment Capacity

The hydraulic and treatment capacity of the WWTP was assessed against recognised design standards for small scale aerobic systems (Crites and Tchobanoglous 1998, Bounds 1996 and Metcalf and Eddy 2003). The key factor currently limiting performance of the WWTP is the widely fluctuating hydraulic load to the system. Aerated Wastewater Treatment Systems (AWTS) have been designed around a consistent hydraulic and pollutant load with limited capacity for adjusting to sudden variations. AWTS generally need 4-8 weeks of consistent flow for microbial communities to adjust to the new food source provided by an increased load. Given the seasonal nature of flow at Lochmara Lodge the system is unlikely to have time to adjust to peak loads before they have reduced to shoulder season levels again. A summary of the capacity and condition of the various components of the WWTP is presented in Table 2.

Table 2: Assessment of Key WWTP Components: Lochmara Lodge

Component	Description	Assessment
Primary treatment	12,000 L operating capacity. Fitted with outlet filters. Sludge return from clarifier currently discharging onto crust layer impacting on treatment.	Satisfactory for expected peak season *average* flow of 5000 L/day. Will handle predicted intermittent peak flows (90th%) up to 7000 L/day. Will require desludging every 3 years.
Secondary treatment chamber	12,000 L capacity with venturi aeration. No media observed in tank.	Hydraulic capacity to treat up to 16,000 L/day. Minimum of 0.5 m^3 of media required (surface area 100-140m^2/m^3). Existing venturi aeration adequate for peak flows.
Clarification chamber	5,500 L capacity. Sludge return using venturi air lift to primary.	Volume adequate but surface area insufficient for clarification of peak season flows.
Final effluent chamber	2,500 L capacity – very limited emergency storage capacity above float switch.	24 hours emergency storage should be provided above the operating level of the pump.

The primary treatment tank appeared to be operating satisfactorily with a healthy crust layer. Primary treatment processes tend to be less sensitive to variations in load when compared to secondary processes and current flow (peak and shoulder season) is within the design capacity. The secondary component was clearly not providing adequate treatment of wastewater despite the fact that design capacity is well above current wastewater flows. This further reinforces the problems associated with the fluctuating load. Simply providing large treatment capacities does

not ensure effective treatment. Limited upflow surface area for clarification would also be impacting on the effectiveness of secondary treatment.

Proposed WWTP Rectification Works

Proposed works to improve the performance of the WWTP are summarised in Table 3 below.

Table 3: Summary of Proposed WWTP Rectification Works: Lochmara Lodge

Works	Description
Fix sludge return outlet to prevent disturbance of primary treatment processes.	The outlet of the sludge return line should be directed into the inlet tee of the primary tank to prevent disturbance of the crust layer.
Install a new flow balancing tank between the primary and secondary tanks to manage fluctuating loads.	A new flow balancing tank with a minimum *operating* capacity of 9,000 L should be installed. Primary treated effluent should overflow to this tank. This tank will require: • A transfer pump suitable for delivering primary effluent to the secondary tank. • An adjustable timer control for pump operation set to spread the delivery of primary effluent out by limiting output to the *average* daily flow for the relevant season. • A low level cut-off float switch and a high level cut-in float switch to prevent pumping dry or overflow. • A gravity emergency overflow to the secondary chamber to prevent overflow in the event of pump failure.
Addition of media for biofilm growth in the secondary chamber.	A minimum of 0.5 m^2 of plastic media with a surface area of 100-140 m^2/m^3 should be installed (fixed and submerged) in the secondary chamber.
Increase in the size of the clarification chamber.	To ensure sufficient surface area is provided for secondary clarification it is recommended that the existing combined clarification/final effluent tank be converted to a single clarification tank. This may require removal or the creating of holes in the wall between the two chambers. The capacity for sludge removal from the whole tank is required.
Installation of a new final effluent pumpwell.	A new pump chamber for final effluent storage prior to irrigation should be installed. The tank should provide 24 hours emergency storage above the operating level of the pump.

These works will provide two key benefits.

1. Flow balancing will ensure loads delivered to the secondary process are stabilized and a much more consistent level of performance is expected. We envisage that in the immediate future a controlled flow rate of $1m^3$/day in conjunction with the flow balancing tank would prevent any significant fluctuations in hydraulic load. If, in the future peak flows get up to $7m^3$/day this balanced output may need to increase up to $3m^3$/day. The idea being that this output should be adjusted to suit recorded flow rates.

2. It will provide long-term capacity for the actual secondary treatment unit to handle up to the $7m^3$/day permitted discharge which, in conjunction with flow balancing would allow for actual wastewater inputs to exceed this figure intermittently through the peak season without compromising effluent quality.

Operation and Maintenance

It will be important that operation and maintenance procedures be adjusted to meet the requirements of the upgraded system. It is envisaged that in the short-term future the provision of flow balancing will allow the WWTP to be operated in a single configuration with a balanced

output of 1,000 L/day to the secondary treatment tank. Each season the system flow should be recorded and the timer control for the flow balancing pump adjusted if necessary to suit any increase in flow from those observed in 2007/2008.

Predicted Upgraded WWTP Capacity and Performance
All proposed rectification works will ensure the system is capable of meeting effluent quality requirements subject to adequate operational oversight. As previously stated we expect that the WWTP will be capable of managing the "Design Occupancy = the 90th % flow from column 2 of Table 1 above. It could manage this flow scenario with a balanced output of 3,000 L/day from the flow balancing tank to the secondary tank. This also means that *average* discharge from the system to the land application field will initially be 1,000 L/day with the capacity to increase to 3,000 L/day while managing design flows. This provides a factor of safety in the consented discharge volume (7,000 L/day) to allow for extreme peak flow events and periods immediately after pump or power failure.

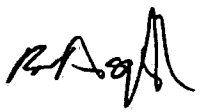
The system will also have additional emergency storage capacity provided by the gravity overflow between the flow balancing well and the secondary tank in the event of irrigation pump failure.

If future flows consistently exceed 5,000 L/day over the December/January period (current 90th % is 2,680 L/day) the primary treatment system *may* begin to display compromised performance. However, the provision of flow balancing and the significant capacity of the secondary treatment components should ensure this is not a significant issue in the unlikely event that the system ever receives consistent flows of 5,000 L/day for a sustained period. All other components (with the addition of flow balancing) are capable of managing a consistent daily load in excess of 7,000 L/day.

I trust this report provides sufficient information for rectification of the WWTP and satisfies the needs of Marlborough District Council. Please do not hesitate to contact me if you require further clarification.

Regards,

Yours sincerely,



Ben Asquith
Consultant

References
Bounds T. (1994) *Septic Tank Sizes for Large Flows,* Orenco Systems Incorporated.

Crites, R and G Tchobanoglous, (1998), Small and decentralised wastewater management, McGraw Hill.

Metcalf and Eddy (2003) *Wastewater Engineering: Treatment and Reuse,* McGraw Hill Press.

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30 May 2003

2378

Mr A Laird
Marlborough District Council
P O Box 443
BLENHEIM

Dear Angus

LOCHMARA LODGE LTD: DOUBLE COVE: U020949

Thank you for your letter of 21 May request further information in the form of a site plan of the proposed land application area for the discharge of treated domestic wastewater.

Thank you also for the advice that Pip Harris is no longer working at the Council.

Enclosed is a site plan and an indicative layout of the irrigation lines as requested. If you refer to the photograph on the cover of the Let's Go Enterprises report, the land application area is in the bush covered hillside to the right of the cottage near the beach on the right hand side of the photo.

I trust the application is now in order for a decision as soon as possible as my clients wish to install the new system in August this year during a period of non-occupancy of the property.

I look forward to your decision.

Yours sincerely
DAVID SMYTHE CONSULTING LTD

DAVID SMYTHE

David R. Smythe
Dip. Surv. (Otago) MNZIS, MNZPI
Resource Management Planner
Registered Surveyor

Lets Go! Enterprises

** Specialists in Wastewater Treatment solutions **

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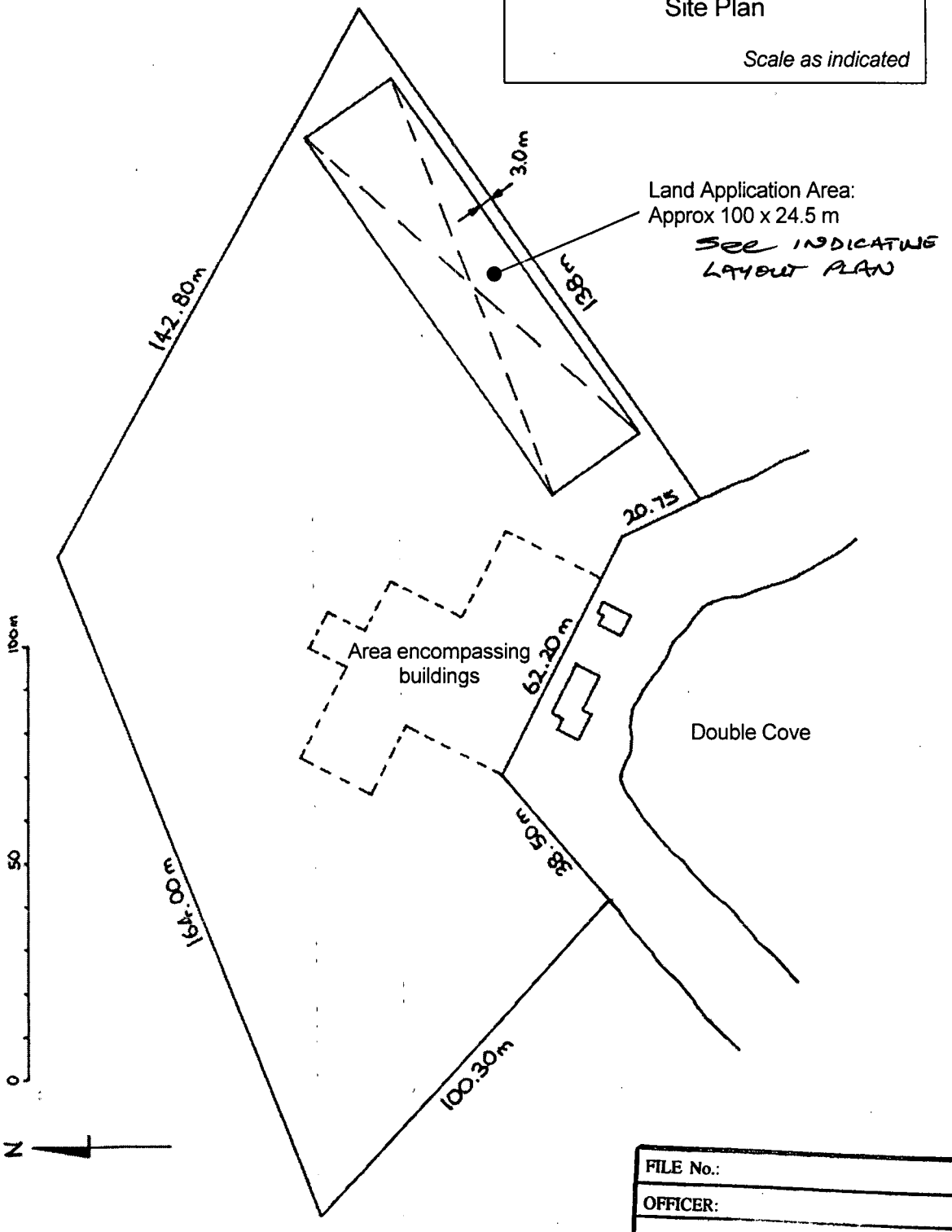
30th May 2003

Lochmara Lodge Ltd

Site Plan

Scale as indicated



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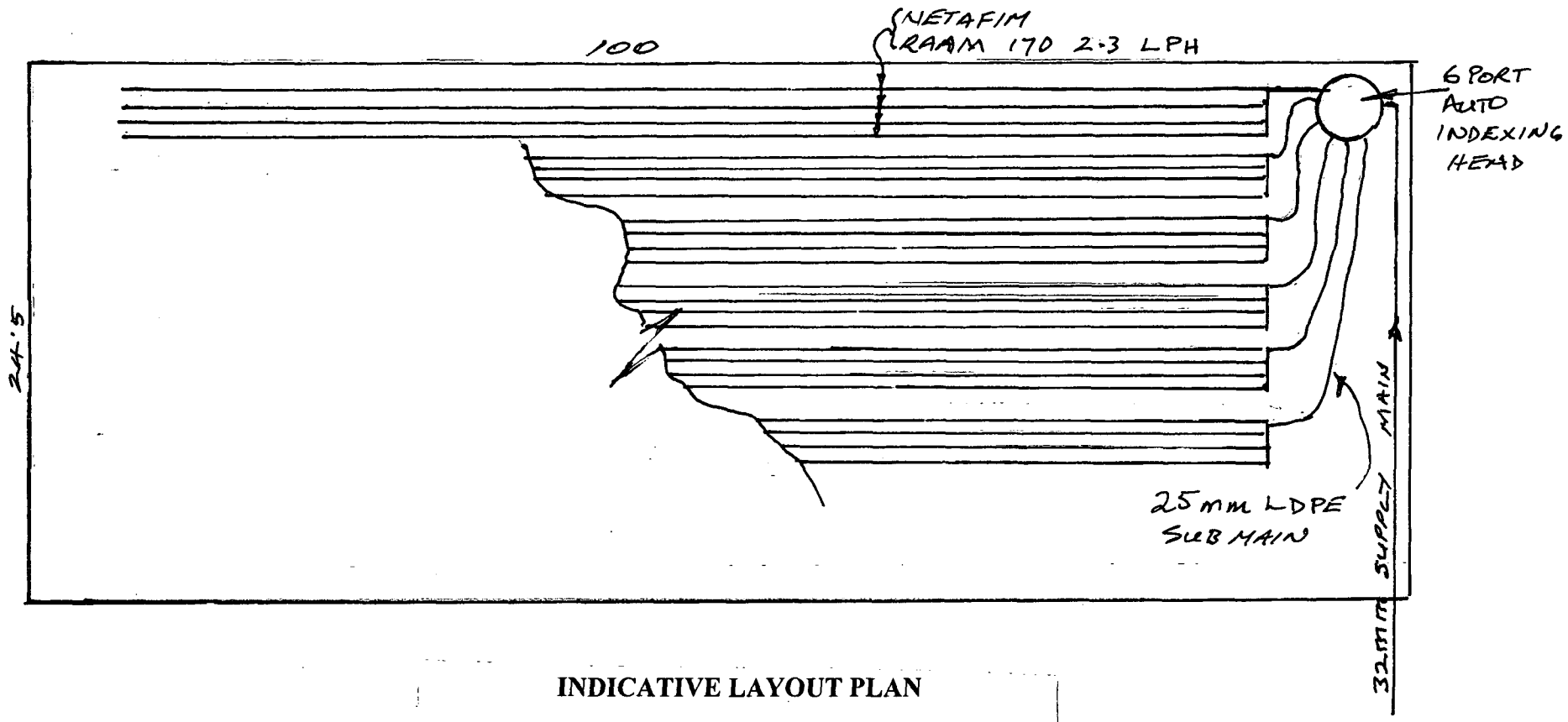
DATE RECV'D	- 3 JUN 2003
	MARLBOROUGH DISTRICT COUNCIL



INDICATIVE LAYOUT PLAN

Not to Scale

IRRIGATION LINES LAID AROUND HILL SIDE CONTOUR

ANNEXURE 1

Lets Go! Enterprises

** Specialists in Wastewater Treatment solutions **

LOCHMARA LODGE LTD
WASTEWATER TREATMENT UPGRADE
DOUBLE COVE
QUEEN CHARLOTTE SOUND

JANUARY 2003

Lets Go! Enterprises

** Specialists in Wastewater Treatment Solutions **

PO Box 1508, Nelson
Ph: (03) 548 8108
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Mobile: 021 LETSGO
Email: lets.go@xtra.co.nz

LOCHMARA LODGE LTD – Effluent Treatment Facility Proposal

1 Introduction

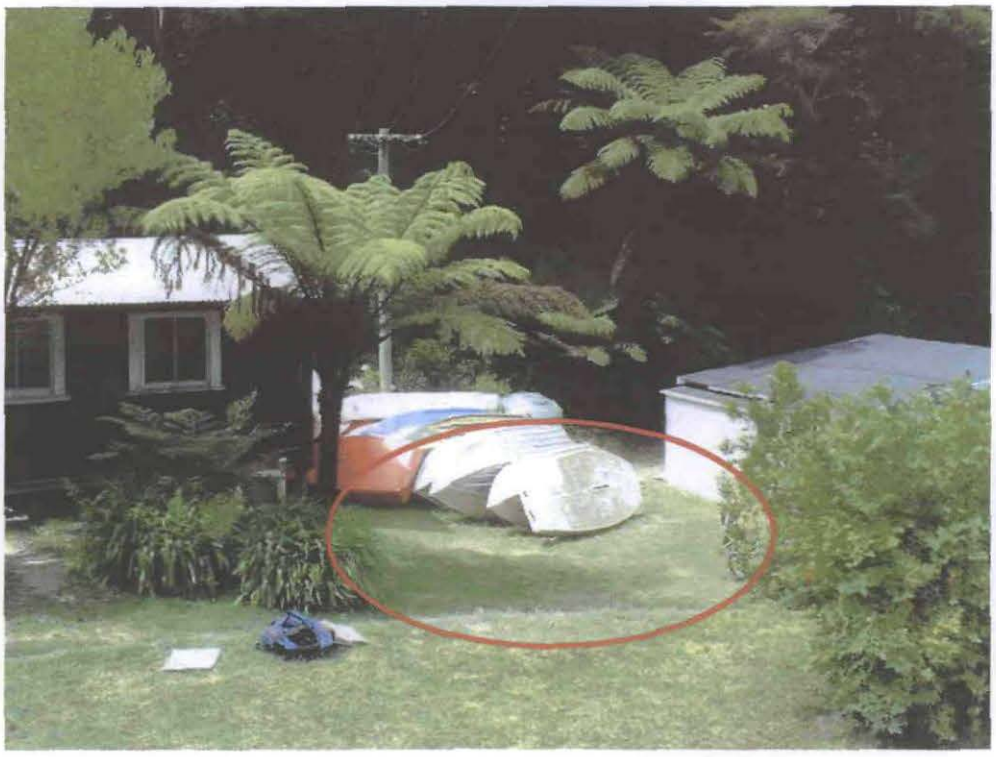
- Lochmara Lodge Ltd is a well-established Accommodation facility operating on Lot 40 DP 1153 being Pt. Sec. 89 Queen Charlotte Sound R.D. located on the western arm of Double Cove, Queen Charlotte Sounds.
- The facility consists of 1 house, 11bachs, communal ablution block and multi function hall
- This property is fronted by a foreshore reserve with no road access and all general supplies and materials come in by boat
- Fresh water is supplied from the western stream on the property and fed to the dwellings via storage tanks and gravity
- Two of dwellings are situated on the foreshore reserve with the remainder grouped in the valley above.
- Power is available from the national grid

2 Scope

- Design, supply, installation (including transport) and commissioning for a Wastewater Treatment Plant and a Land Application System treating up to 7,000 litres per day of Domestic type wastewater from the combined buildings known as Lochmara Lodge Ltd.
- Decommissioning old Septic Tank System

3 Assumptions

- Existing power supply at the Hall/Workshop is sufficient to run the system – approx 2kW max single phase.
- A Council Hearing is not required to obtain the necessary Building/ discharge or excavation permits
- DOC approval to use part of the Foreshore Reserve to install the system (exact boundary unknown) - see following photograph for proposed location.



Proposed Area for the Wastewater Treatment Plant upgrade

3.1 Design Criteria

The existing accommodation facility accommodates up to 50 Persons over a short period of time in the summer months.

To handle the loadings from the various buildings that will vary between full and nothing for periods of time. The discharged effluent should meet the standards as set by the MDC and comply with AS/NZS 1547:2000.

The buildings all have a Greywater outlet that services mainly kitchens and in some cases showers and bath/washroom facilities.

The communal ablution block comprises of x4 showers, handbasins and x4 pans.

Buildings are supplied by water from a stream (located on the property).

- Up to 50 persons
- Standard Pans
- Basic Laundry facilities
- No dishwashers
- Showers only, no baths/spas
- Standard Bathroom and Kitchen fixtures

***Note**: Allowance made for possible upgrade to decentralised ablutions.*

Flow volumes

4 Design Guidelines

- Minimal operator input
- Reliable, odour free operation
- Environmentally friendly
- Sufficient storage to cover for power outages
- Low maintenance
- Minimal sludge pump outs
- Fully adjustable to meet the varying loads throughout the year
- Cost effective
- Proven technology
- Efficient and timely backup service

5 Proposed Wastewater Treatment System

5.1 Design Loading

The following design flows have been calculated using information taken from Appendix 4.2D in the AS/NZS 1547:2000 standard

Number of occupants	50 persons
Flow Allowance	130 litres/person/day
Sub total	*6,500 litres /day*
Contingency	500 litres/day
Total Flow Allowance:	**7,000 litres/day**

The minimum flow during the winter season would drop to 0 litres/day.

Note: The above figure includes both Black and Grey wastewater combined.

5.2 System Details

5.2.1 General

The following details are indicative of the arrangement and placement of the treatment tanks. However the combined processing and reserve capacities will be maintained if not increased in the final design.

The proposed system is a STEMPHLOW BM4 Aerated Wastewater Treatment Plant (AWTP) designed as site-specific using propriety components. All the tanks are of a fibreglass design and fitted out onsite.

It is envisaged that the overall system will be made up of 3 separate in-ground tanks encompassing a primary process, aeration process, pump out chamber and irrigation system.

The combined area that this system will take up is approximately 24 square metres with the big tanks being 4 metres long and 2 metres wide. Note the system can easily be separated to fit into the contours of the gardens and land.

A single lift station (1200 litre chamber & pump) will be incorporated in the system layout to service the bach closest to the sea.

The System would consist of:

X1 twin chambered primary treatment tank	12,000 litres
X1 aeration (secondary treatment tank)	12,000 litres
X1 clarification/ pumpout tank	8,000 litres

Lift Chamber

X1 single tank with pump	1,200 litres

Total tank volume:	33,200 litres
Reserve Capacity:	7,000 litres
Processing Volume:	26,200 litres

Effluent Retention Time: 3.7 days

5.2.2 Overview for the System

Primary Treatment System

Tank capacity: 12,000L

Primary Chamber (anaerobic/septic)

All domestic type wastewater enters this chamber. Anaerobic, and other oxidising bacteria breakdown the suspended solid material. The anaerobic digestion achieves a reduction in B.O.D. (Biochemical Oxygen Demand) of up to 40%. This chamber also receives highly activated aerated sludge from the Clarifying Chamber. The introduction of this highly aerated sludge stimulates the bacteria and enhances the level of solids digestion.

Second Primary Chamber (anaerobic/septic)

The wastewater is able to flow freely from the 1st Primary Chamber to this chamber. This allows for the adequate mixing of the partially treated wastewater. The mixing fully prepares the wastewater for the following processes. The waste passes through the proprietary filters before entering the Secondary Treatment Process. The proprietary filters serve two purposes; one being to retain 90% of the solids in primary tank and the other purpose is to protect the system from surge loadings.

Secondary Treatment System

Tank capacity: 12,000L

Aerobic Chamber (aeration/oxygenated)

The semi treated wastewater flows from the Primary Treatment tank to the Aeration Chamber. The oxygen for this chamber is supplied via bank of venturis operating off a single submersible pump within the tank. The venturis force oxygen into the wastewater stream. This achieves a high level of dissolved oxygen impregnation. The Aeration Chamber contains submerged GAIBE media. GAIBE is a porous natural mineral that attracts and enhances the bacterium Nitrobacter and Nitrosomonas, which replenish free oxygen. In addition to ammonia, many wastewaters contain other metal residues that are concentrated by GAIBE during the ion exchange processes. Enhanced aerobic bacterial action results in a very high level of aerobic treatment and a reduction in the accumulation of biological sludge.

Clarifying Chamber (settling and sludge return)

Tank capacity: 5,500L

The treated wastewater passes from the Aerobic Chamber to the Clarifying Chamber. Any minute particles of suspended solids settle to the bottom allowing only clean odourless water to pass to the following chamber. A dedicated venturi run from the aeration pump performs the function of sludge return back to the 1st Primary Tank.

Irrigation Chamber (pump-out)

Tank capacity: 2,500L

The fully treated wastewater flows into the Irrigation Chamber from the clarification chamber. Here a simple energy efficient pump automatically pumps out to irrigate gardens, trees or landscaped area via a network of Netafim RAAM dripper line. An inline filter is fitted into the discharge line to protect the dripper line emitters.

Tertiary Treatment System

A UV sterilization unit is fitted on the pumpout line after the inline filter. The UV reduces the faecal coliform count to a level where discharged liquid can be can be applied to the land using a surface/ covered dripper line system.

5.2.3 System Monitoring and Control

The system comes complete with the most advanced alarm monitoring system available within the industry.

This electrical control unit is a state of the art, tamper-proof, microprocessor controlled, multi-functional, low voltage, safe, fully programmable, expandable system with additional outputs to run separate electrical items such as outdoor lighting for example.

This system can be set for "Stay" and "Away" mode to suit periods of dormancy and intermittent use that occur in holiday homes.

If a malfunction occurs, an alarm will sound along with a visual alarm (light) will come on. Once this is switched to "Mute" if the malfunction has not been fixed within 24hrs, the alarm will sound once again.

This technology makes the system almost impervious to flooding and offers very real protection for the environment.

5.2.4 *Safety Features*

24 hours of Reserve capacity is built into the design of the system as a contingency to cover any unforeseen events that may impair the operation of the main controller.

Some scenarios accounted for are:

- In the event of a total site power failure, the system can hold an additional 7,000 litres before over-flowing. Any effluent over flowing from the system will occur at the end of the process (pumpout chamber) therefore no raw effluent will end up on the ground
- In the event of Wastewater Treatment Plant having a power outage, an alarm (visual + audio + remote) would sound indicating that a problem has developed.
- The AWTP will be fed from 2 separate supplies – one main supply for the pumps etc and the other separate control supply for the Microprocessor Controller.
- The pump out chamber is fitted with a high water level alarm to give ample warning that the system is running into difficulties.
- In the event of that any one of the pumps blows a fuse an alarm (visual + audio) would sound indicating that a problem has developed without bringing the whole system to a stand still.

5.2.5 *Visual Impact*

All tanks will be installed in-ground.

A fibreglass electrical box (500mmL x 300mmW x 400mmH) will sit on one of the tanks .

Various maintenance access points will be finished at ground level to enable trouble free access in the future.

A 450mm concrete Culvert is to be installed to handle the water flow in the stream running across the main access path. The excavated fill will be spread between the two lower bachs and the wastewater system to give even sloping area down to the beach – see following photo.

Area to level out with excavated fill (still maintain slope)

5.3 *Effluent Quality*

This site specific STEMPHLOW – BM4 Aerated Wastewater Treatment Plant will be capable of exceeding the recommended minimum effluent quality standard set for subsurface dripper line irrigation in AS/NZS 1547:2000;

BOD5	< 20 milligrams per litre
Suspended Solids	< 30 milligrams per litre
Faecal Coliform	< 1000 cfu per 100 millilitres

With the UV sterilization unit it is highly likely that the discharged effluent will be below 10cfu/100mls. Lochmara Lodge in the Marlborough Sounds is currently performing below this level.

5.4 *Land Application System (STEMPHLOW system)*

5.4.1 *Area*

The proposed area is covered in mature native bush on a slope between 25 and 30 degrees. The ground cover is a layer (approx 200mm) of soil covered with decomposing vegetation from the fallen foliage above.

The layer below the topsoil falls into the category 5 soil type – Table 4.2A4 AS/NZS 1547:2000.

Recommended Design Irrigation Rate (DIR) for irrigation systems and Category 5 soils is: 20mm/week.

Note: 1mm is equivalent to 1 litre of water covering 1 square metre per day

Area required for the Land Application Area (irrigation area)

Max Loading	49,000L/week
DIR	20mm/week
Area	**2,450m^2**

This area could well be situated on the slopes on the eastern side of the property.

All irrigation dripper line laid in the bush should be pegged and covered with the decomposing layer over the topsoil.

The dripper line will be RAAM 17D 2.3LPH 0.6M (similar to a garden hose with built in emitters) and connected to a low density alkathene supply line from the irrigation pump via a auto sequencing valve.

5.4.2 General Description

A Network of covered dripper lines in the areas identified on the following attached map will form the Land Application System (irrigation system).

The Land Application System will use the "Dose Loading" method for application in the soil.

5.4.3 Design Irrigation Rate per dose

Total estimated daily flow	7000	litres / day
Number of Doses	30	doses / day
Discharge per dose	233	litres / dose - approx
Estimated Duration	10	min/dose
Design Flow	1400	litres/hour
Irrigation Rate (RAAM 17D)	3.5	litres/hour/metre
Irrigation Zone Size	400	linear metres of RAAM dripper line
Total RAAM Required	2400	metres
Number of Zones required	6	zones
Land Application Area	400	square metres/zone
DIR per dose	0.58	mm / dose

5.4.4 Materials Schedule

Discharge Pump	Grundfos CR5-15 (or similar)
Auto Indexing Head	6 Zone outlets
Water Meter	25mm SOCAM PC25
Inline Filter	Long Body Araag, 32mm
Supply Line	25mm LDPE
Main	25mm LDPE
Submain	16mm Lateral
Laterals	NETAFIM RAAM 17D, 2.3 LPH, 0.6M (2,400 metres)

Lateral Spacing	0.6 – 1.0m
Warning Signs	"Danger Effluent disposal area" or similar
Sampling Point	15mm takeoff with isolating valve

5.5 Excavations

Approximately 35 cubic metres of fill needs removing and relocating for the installation of the STEMPHLOW - BM4 Aerated Wastewater Treatment Plant. A large proportion of the excavated soil will be reused to develop the landscaped area between the system and the lower bah on the western side of the property.

Minor land disturbance is required to install the Land Application System around the property.

5.6 Quality Management

As per the manufacturers policy, this AWTP is to be covered by a Maintenance Contract that the property owner has already contractually agreed to enter into. In accordance with this, **Lets Go! Enterprises** undertakes to service the system on a six monthly Programmed Maintenance basis – following which a copy of the service report will be sent to the Tasman District Council, and the owner if requested. The Maintenance Contract remains in force until the system is decommissioned or removed and the payments of the fee during this time must be made by the owner to ensure continuity of the Programmed Maintenance.

5.6.1 Daily Maintenance
Record discharge water meter reading — Responsibility: Owners

5.6.2 Routine Service
This service occurs on average 2 times a year — Responsibility: LGE technician

Typical maintenance service includes:

- Pump testing
- Clean all filters
- Test alarms and alarm triggers
- Check Land Application System for correct operation
- Assess AWTP health
- Check in with resident owners
- View AWTP discharge readings for the previous months operation

- Sludge assessment
- Clean UV sterilisation unit

5.6.3 Service Contract Costs

Approx $400.00 + GST per annum

Includes both the routine servicing onsite (3 services/ year)
Does not include callouts due to negligence or improper use or abuse

The UV sterilisation unit requires a lamp change very 12months at a material cost approx $200.00 + GST. Labour to carry this out is included in the above service contract cost.

5.6.4 Warranty

The design life of the system is 50 years.

The new standards require tank and components (excluding electrical) covered free of defects for 15 years and electrical for 2 years back to base full cover warrantee against defects.

As for the irrigation field, I will guarantee the irrigation field for 5 years against defects that result in ponding, odour or adverse accumulative effects to personal property. All components of the land application system will be subject to their respective warranties at date of purchase.

5.6.5 Desludging

The primary treatment tanks may require desludging in about 10 years from commissioning. This is consistent with other commercial I have operating in the area.

5.7 Power Consumption

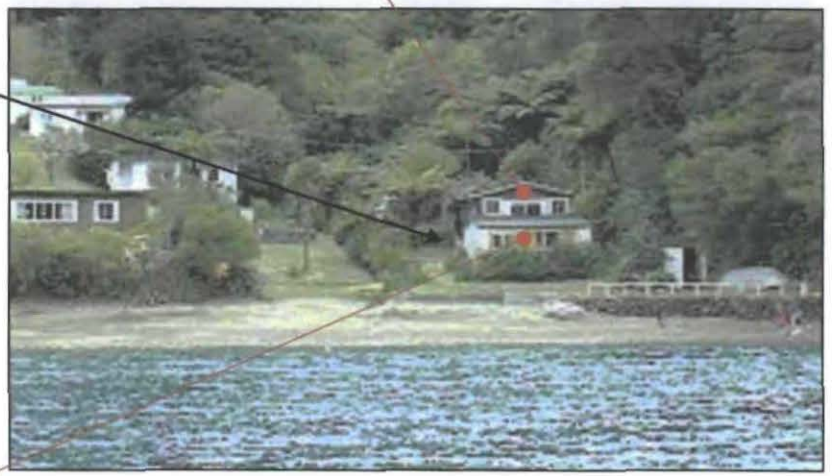
Maximum load:	Aeration pump:	600 W	single phase
	Irrigation pump:	1.5 kW	single phase
	Lift pump:	300 W	single phase

LETS GO ENTERPRISES

Mardy Audier
Wastewater Treatment Specialist

Function Hall

Facing East



Facing North

Front Bach

ANNEXURE 2

Lets Go! Enterprises

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Fax: (03) 548,8068
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Email: lets.go@xtra.co.nz

22nd June 2002

Lochmara Lodge Ltd Wastewater Treatment Assessment Report

1 Introduction

- Lochmara Lodge Ltd is a well-established Accommodation facility operating on Lot 40 DP 1153 being Pt. Sec. 89 Queen Charlotte Sound R.D. located on the western arm of Double Cove, Queen Charlotte Sounds.
- Fresh water is supplied from the western stream on the property and fed to the dwellings via storage tanks and gravity
- Power is available from the national grid
- The facility consists of 1 house, 11bachs, communal ablution block and multi function hall
- This property is fronted by a foreshore reserve with no road access and all general supplies and materials come in by boat
- Two of dwellings are situated on the foreshore reserve with the remainder grouped in the valley.

2 Existing System

- Black wastewater is separated in a 3 chamber (approx 3300L) concrete septic tank before passing to the lift station.

  The lift station comprises of a 1100L prefabricated tank with a discharge pump that dose loads the liquor up to a header tank above the soakage trenches. The operation of the discharge pump is manually controlled.

  There are 3 separate soakage trenches each with a manually controlled isolating valve. The trenches are gravity fed from the 1100L header tank.

- The Grey wastewater from the majority of the dwellings runs into a soakage trench that runs beneath the walkway heading out to the jetty.

  The remainder of the Greywater feeds into an existing septic tank that is located below the house on the foreshore reserve.

  Due to the tightening of effluent quality standards this method of disposal at the expected effluent quality is no longer acceptable so close to the waters edge.

3 Proposed Wastewater Treatment System

3.1 Design Criteria

The existing accommodation facility accommodates up to 50 Persons over a short period of time in the summer months.

To handle the loadings from the various buildings that will vary between full and nothing for periods of time. The discharged effluent should meet the standards as set by the MDC and comply with AS/NZS 1547:2000.

The buildings all have a Greywater outlet that services mainly kitchens and in some cases showers and bath/washroom facilities.

The communal ablution block comprises of x4 showers, handbasins and x4 pans.

Buildings are supplied by water from a stream (located on the property).

- Up to 50 persons
- Standard Pans
- Basic Laundry facilities
- No dishwashers
- Showers only, no baths/spas
- Standard Bathroom and Kitchen fixtures

3.2 Loading

The following design flows have been calculated using information taken from Appendix 4.2D in the AS/NZS 1547:2000 standard

Max. no. of occupants	50 persons
Flow Allowance	130 litres/person/day
Sub total	*6,500 litres /day*
Contingency	500 litres/day
Total Flow Allowance:	**7,000 litres/day**

The minimum flow during the winter season would drop to 0 litres/day.

Note: The above figure includes both Black and Grey wastewater combined.

3.3 Land Application Area:

The proposed area is covered in mature native bush on a slope between 25 and 30 degrees. The ground cover is a layer (approx 200mm) of soil covered with decomposing vegetation from the fallen foliage above.

The layer below the topsoil falls into the category 5 soil type – Table 4.2A4 AS/NZS 1547:2000.

Recommended Design Irrigation Rate (DIR) for irrigation systems and Category 5 soils is: 20mm/week.

Note: 1mm is equivalent to 1 litre of water covering 1 square metre per day

Area required for the Land Application Area (irrigation area)

Max Loading	49,000L/week
DIR	20mm/week
Area	**2,450m^2**

This area could well be situated on the slopes on the eastern side of the property.

All irrigation dripper line laid in the bush should be pegged and covered within the decomposing layer of the topsoil.

The dripper line will be RAAM 17D 2.3LPH 0.6M (similar to a garden hose with built in emitters) and connected to a low density alkathene supply line from the irrigation pump.

3.4 Effluent Quality

Double Cove comes under the Sounds Residential Zoning that in this case requires an effluent quality of:

- BOD5 level of less than 100mg/litre
- Suspended Solid level of less than 60mg/litre
- Faecal Coliform (FC) count of less than 1000units/100ml.

However for dripper line irrigation the recommended effluent quality is[*1]:

- BOD5 level of less than 20mg/litre
- Suspended Solid level of less than 30mg/litre

Note: Using conventional soakage lines would still require the same disposal area and approx 1,000m of 0.5m wide trenches.

3.5 System Outline

3.5.1 General

The main tanks would be installed in the same location as the existing septic. The grey wastewater from the dwellings and ablution block can be feed in at the current septic tank.

A multi chambered septic tank situated below the house and bach on the foreshore reserve will serve as a lift station to the main wastewater treatment system.

Footnote:
[*1] AS/NZS 1547:2000

3.5.2 Suitable Types of Systems

- Improved septic tank plus sand contactor and UV
- Aerated Wastewater Treatment Plant and UV

4 Investment

Guide to schedule of prices*2

Preliminary & General	1,250.00 incl DOC permit for lift station
Irrigation Pump	2,200.00
Irrigation Materials	1,750.00
UV sterilisation Unit	2,200.00
Digger & Drainlayer	2,500.00
Drainage Materials	1,400.00
Electrical	1,100.00
Labour	1,800.00
Treatment System	40,000.00 – 70,000.00 depending on system
Total:	**$54,200.00 to $84,200.00**

5 Next Step

Options

- Set a budget and timescale to work within
- Compile a list of questions, have a meeting or call me to clarify any points
- Set the system parameters and go out for tender to compare apples with apples

Mardy Audier
Wastewater Consultant

Footnote:
*2 All prices exclude GST