KERRIGAN ENGINEERS LTD

ENGINEERING REPORT

For Mr & Mrs P & G Rutherford

Site Evaluation for Waste Water Treatment and Disposal for site at 49 Onahau Bay Road, Onahau Bay, Queen Charlotte Sound

May 2014 - **FINAL**

By Graham Kerrigan

Job Number: 3597

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ENGINEERING REPORT

Mr & Mrs P & G Rutherford

49 Onahau Bay Road

Queen Charlotte Sound

CONTENTS

A SYNOPSIS

SCOPE OF INVESTIGATION

The site was inspected on 10 February 2014. The site evaluation generally followed the recommendations of NZS/AS 1547:2012.

Appended to this report is: the site and soil evaluation sheets based on the forms of NZS/AS1547:2012, and our professional opinion statement on slope stability.

SUMMARY/ CONCLUSIONS

The purpose of this report is to satisfy Marlborough District Councils Resource Management plan that necessitates a resource consent application for the proposed discharge domestic waste water to land within the Marlborough Sound Area. This report supplements a Resource Consent application made by the owners or their agents.

The site is located on the northern side of Onahau Bay in the Queen Charlotte Sound. The site is on south facing slopes of the ridge formation separating Mistletoe Bay and Waterfall Bay. The slopes vary over the property and is generally is about 25- 30 degrees. The proposed discharge area is covered with regenerating native species

The onsite waste disposal option for this property will include a new secondary treatment plant. The discharge to land will be a Raam pressure equalising drip irrigation system discharging downslope to an area bisected by the existing walkway. The walk way provides protection from runoff entering the irrigation field.

We consider that there would be no adverse effects on the environment as a result of installing a secondary treatment and Raam irrigation system along with the existing trench system so long as the considerations /recommendations outlined in this report are followed.

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RECOMMENDATIONS

Based on the following report we make the following recommendations with respect to construction of an on site waste disposal system at this site:

- We consider that there are no site concerns that warrant tertiary treatment. There is reasonable room on the site for discharge of secondary waste to the surrounding vegetated location.

- Per MDC Guidelines the average daily flow is 840 litres per day. This is based on water usage of 140 l/c/day and the house occupancy of 6 people.

- The soils at the proposed irrigation location are considered category 5 soils the DIR is 2.4mm per day.

- The irrigation pipes should be laid at about 1m centres with Raam outlet ports at 600mm centres.

- We recommend that only registered tradesmen familiar with the construction of an LPED land application system and working to the National Plumbing and Drainage code NZS/AS 3500 should carry out all plumbing and drainage works associated with this treatment and land application system.

- The design of the waste disposal system should be carried out by a Chartered Professional Engineer and be should be consistent with the herein recommendations.

- The construction should be consistent with the design with respect to the herein discussion and recommendations and should be inspected by a Chartered Professional Engineer.

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B REPORT

INTRODUCTION

The purpose of this report is to satisfy Marlborough District Councils Resource Management plan requirements to discharge domestic wastewater in the Marlborough Sounds and generally follows the requirements of NZS 1547:2012

The following reports on the most favoured option for wastewater treatment and on site disposal at a property of Mr and Mrs Rutherford.

SITE DESCRIPTION

The site is located at 49 Onahau Bay Road on the northern slope of Onahau Bay in the Queen Charlotte Sound. The legal description is PtLot 35 DP 1728. The property is approximately 0.56 ha and has reasonable room to locate an onsite secondary treated irrigation waste disposal.

The ground slope of the property varies and in the proposed location of the waste disposal the slope is approximately 25 degrees and steepens up slope, to the north, and closer to the Onahau Road. There are ample other areas that are suitable as reserve areas , however their location is on more steep vegetated land at about 30 degrees.

The proposed irrigation disposal area is covered in regenerating vegetation that has a good overlay of topsoil and humus. The discharge area is bisected by the existing walkway. The walk way provides protection from runoff entering the irrigation field

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WASTE WATER TREATMENT SYSTEM

The site evaluation generally followed the recommendations of NZS/AS 1547:2012 and appended to this report are the standard site and soil evaluation sheets.

The property is sufficiently large enough to accommodate secondary treated effluent disposal via a Raam irrigation system to the surrounding vegetated areas of the property.

We consider that there are no site concerns that warrant tertiary treatment and there is reasonable room for the irrigation of secondary treated waste.

The proposed dwelling will be 3 bedrooms. Based the water usage of 140 l/c/day (per on-site roof water tank supply) and the house occupancy of 6 people, the average daily flow is 840 litres per day.

The property owners are interested in installing a Natural Flow Eco Wastewater system supplied by Waterflow NZ limited. We understand from the suppliers that this system meets the secondary treatments standard requirements and have been approved by Council gand installed in other locations in the Sound area.

One of the merits of the system is that its processing does not entail power input as the waste is processed from composting and that worm activities. In addition as the discharge area is below the dwelling it allows the discharge to the irrigation using siphon system. The proposed siphon is a Flout system, supplied by Rissey Plastics limited that will flood the irrigation lines in a similar fashion as a pump would do.

WASTE WATER DISPOSAL SYSTEM

The property is sufficiently large to accommodate secondary treated effluent disposal via a Raam pressure equalising irrigation system.

The soils at the proposed irrigation location are considered category 5 based on the underlying strongly structured light clays and consistent with the requirements of table M1 - AS/NZS 1547:2012. The topsoil/ humus layer exceeds 150-250mm requirement of the standard and the drip irrigation will be to this material for nutrient take up (also refer to the Site and Soil Evaluation sheet attached in Appendix 2). In addition the site is well vegetated with natural growth and with significant root coverage and although we consider that a superior discharge rate can be achieved at this location we have adopted the conservative requirements of AS/NZS 1547:2012 to meet compliance requirements.

For the category 5 soils the DIR is considered to be 3.0mm per day per table M 1 of AS/NZS 1547:2012 for drip irrigation.

We note that the slope of the irrigation sites exceeds the requirements of table M2 of AS/NZS 1547:2012, and we note that these requirements would be exceeded in most bach locations in the Sounds area. Although most existing bach locations would be

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discharging at a higher rate compared to the current code requirements we have not noted any performance concerns due to slope of any of our past designs. Also we are not aware of irrigation bed failures due to other installations following the past standard of NZS/AS 1547:2000. Yet the current standard's table M2 would suggest that in locations greater than 17 degree slope the historical design would be under designed by 100%. We suggest that if this were the case there would be evidence of failure throughout due to historical installations.

Based on our observations of existing systems in the Sounds we presume that the adjustment factors of table M-2 of AS/NZS 1547:2012 are not based on vegetated areas. We note that this loading rate for Category 5 soils includes the need for 150-250mm of insitu topsoil to slow soakage and assist with nutrient reduction. However no mention is made of the effects of well vegetated areas such as this location and similar locations in the Marlborough Sounds.

Hence we attribute the historically superior performance of onsite waste disposal systems in the Marlborough Sounds is due to the significant vegetation of the locations. We consider that the generous thickness of humus/topsoil and generally lush root systems of regenerating bush in these locations has a significant influence on the moisture take up via evapotranspiration and nutrient take up via natural biological reduction.

We have also reviewed other recent onsite waste disposal applications and design in the Marlborough Sounds and note somewhat similar site conditions to this location. We note a peer review has been undertaken due to the slope issue of table M2 of AS/NZS 1547 and a 20% reduction in the DIR has been accepted by Council. We have adopted a similar reduction of 20% in the DIR to suit the past peer reviews and acceptance.

Based on the foregoing discussion we have determined that a 20 % reduction in DIR is appropriate bringing the loading rate from the standard requirement of DIR of 3.0mm/day to 2.4mm/day and this should be conservative for this vegetated property.

Therefore the required irrigation area is 350m2 (being 840/2.4).

The irrigation pipes should be laid at about 1m centres with Raam pressure equalising outlets at 600mm centres.

The discharge area is bisected by the existing walkway. The walk way provides protection from runoff entering the irrigation field.

We recommend that only registered tradesmen familiar with the construction of an LPED land application system and working to the National Plumbing and Drainage code NZS/AS 3500 should carry out all plumbing and drainage works associated with this treatment and land application system.

We recommend that the installation and operation be verified by a Chartered Professional Engineer. This verification should include confirmation that the construction complies with the design.

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ENVIRONNMENTAL EFFECTS

The soils in the area have a low permeability and we anticipate that there will be reasonably slow movement of waste water through the soils to allow nutrient take up with the recommended DIR of 2.4mm/day. The slow rate should ensure that the waste retention and treatment is adequately long enough to minimize the risk of environmental effects.

The design of the waste disposal system should be carried out by a Chartered Professional Engineer and be should be consistent with the herein recommendations. The construction should be consistent with the design with respect to the herein discussion and recommendations and should be inspected by a Chartered Professional Engineer.

Also the site is located within the MDC hazard overlay for slope stability. The proposed waste disposal irrigation area location is on a varying slope of about 25 degrees. We consider this recommended 2.4mm/day waste irrigation rate will not cause instability concerns at this location. Attached to this report is a MDC standard professional opinion on this matter as required by the Resource Management plan requirements?

The recommendations presented in this report are based on the requirements of NZS/AS 1547:2012 and so long as the design and construction are carried out to the recommendations and considerations of this report, and NZS/AS 1547:2012, and the MDC Guidelines for onsite waste disposal, we consider there will only be acceptable environmental effects.

LIMITATION OF REPORT

This report has been prepared solely for the benefit for Mr & Mrs Rutherford with respect to our understanding of the request. The reliance by other parties on the information or opinions contained in the report shall, without our prior review and agreement in writing, be at such parties' sole risk.

This report is based on our interpretation of our visual examination and limited soil tests only and does not preclude the possibility of differing soil properties and/or other relevant physical features being present between the test locations or hidden from view. Opinions and judgements expressed herein are based on our understanding and interpretation of current regulatory standards, and should not be construed as legal opinions. Where opinions or judgements are to be relied on they should be independently verified with appropriate legal advice.

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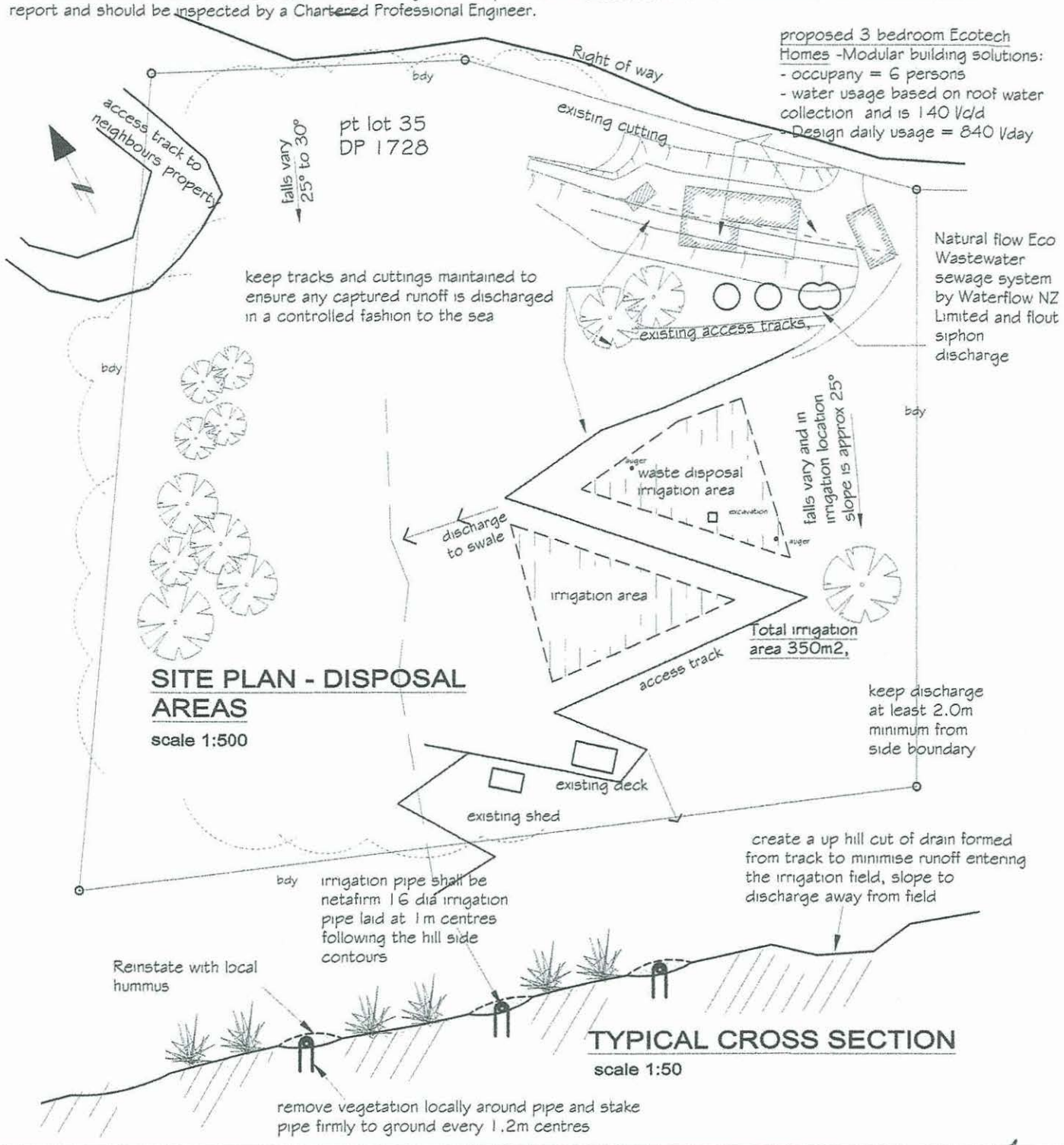
RECOMMENDATIONS:

· The soils at the proposed irrigation location are considered category 5 soils - strongly structured with a DIR is 2.4mm per day
· The irrigation pipes should be laid at about 1 m centres with perforations at 600mm centres with an operation pressure of 1.6 litres per hour.
· We recommend that only registered tradesmen familiar with the construction of an LPED land application system and working to the National Plumbing and Drainage code NZS/AS 3500 should carry out all plumbing and drainage works associated with this treatment and land application system.
· The design of the waste disposal system should be carried out by a Chartered Professional Engineer and be should be consistent with the herein recommendations.
. The construction should be consistent with the design with respect to the discussion and recommendations of the assessment report and should be inspected by a Chartered Professional Engineer.



SITE PLAN - DISPOSAL AREAS

scale 1:500

TYPICAL CROSS SECTION

scale 1:50

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Project Title:

P & G RUTHERFORD - 49 ONAHAU ROAD - ONAHAU BAY - QUEEN CHARLOTTE SOUND

Drawing Title:

RESOURCE CONSENT APPLICATION - DISCHARGE PERMIT - ON SITE WASTE DISPOSAL

DRN: gck	APPROVED:
DES: gck	DATE: May 14
SCALE: as shown	
Dwg. No. 3549	
Sht. 1	
rev.	

FILE: ..\RC Issues

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SITE INFORMATION SHEET – DESK TOP EVALUATION

Figure D2 AS/NZA 1547:2012

1.0 SITE INFORMATION (desk-top evaluation)

1.1 Location details:

Locality	:	47 Onahau Bay Road, Queen Charlotte Sound, Marlborough
Owner	:	Mr & Mrs Paul and Gay Rutherford
Address	:	Relay information to Kerrigan Engineers ltd
Phone	:	03 5784 085
Survey plan details	:	Pt Lot No 35 : ....., DP No: 1728
Grid Reference E N	:	na
Aerial photo details	:	refer to Kerrigan Engineers file 3597
Topographic map no	:	na
Orthophotomap no	:	na
Regional Authority	:	Marlborough District Council
Local government	:	Marlborough District Council
Site plan details attached (Ref. no or description)	:	refer to Kerrigan Engineers file 3597 report

1.2 Soil type and major soil considerations from soil maps , or similar

Data source used : Generic reference from CET training manual

1.3 Geology of site from geological map:

1.4 Climate

Annual rainfall	:	na
Annual evaporation	:	na

General comment (rainfall intensities, seasonal variation etc)

Data source used: na

1.5 Intended water supply source

Public supply : ~~local reticulation~~ Rainwater (roof collection) ~~Bore/Well/Dam~~

1.6 Local experience with existing on-site systems

Number of systems in locality:		numerous since 2002
Performance (%)	:	no performance problems known
Reasons/descriptions	:	na
Satisfactory	:	na
Failed	:	na
Problems evident	:	na

Photograph(s)/video attached (delete one) ~~YES~~/NO (specify details):

1.7 **Preliminary evaluation of solutions which could be feasible:** Our past design of disposal in the Queen Charlotte Sound locations is LPED irrigation of secondary or primary septic waste. The Sounds properties normally includes sufficient disposal area and significant vegetation to enable evapotranspiration of waste and biological decomposing into the receiving soils without environmental impact. However the underlying clayey silt structure and slope limitations of AS/NZS 1547 may impact the use of LPED of primary waste. Hence it is likely that a secondary treatment plant will be necessary with an irrigation field using pressure equalizing emitters to disperse waste into the vegetated hill slope.

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SITE AND SOIL EVALUATION FORM – SITE INFORMATION SHEET

Figure D3 AS/NZS 1547:2012

1.0 SITE EVALUATOR(S)

1.1	**Name** (principal evaluator)	:	*Graham Kerrigan*
	Designation	:	*Chartered Professional Engineer*
	Company	:	*Kerrigan Engineers Limited*
	Address	:	*95b Maxwell Road, Blenheim*
	Phone	:	*03 5784085, 027 6494299*
	Fax	:	*nil*
	Email	:	*kerrigan.engineers@xtra.co.nz*
1.1	Additional staff involved	:	*none*

2.0 ONSITE EVALUATION

2.1 Work undertaken

Details	:	*Viewed site, excavation and bores*
Date	:	*10 February 2014*
Weather (on day & preceding week)	:	*Fine*
Photocopy of desktop study attached	:	*Yes~~/No~~*

2.2 Topography

Slope	:	*varies over site but generally 25 degrees*
Ground cover	:	*vegetated natural regenerating bush*
Geology confirm	:	*Yes~~/No~~*
Soil landscape confirmed	:	*Yes~~/No~~*
Drainage patterns		*:Part of developed residential baches with access tracks providing reasonable runoff control*
Site plan details attached	:	*Yes~~/No~~*
Clearance	:	Okay
Boundaries	:	*the northern boundary adjoins the ROW that accesses neighbouring properties and the southern boundary adjoins the foreshore reserve, the east and west boundaries adjoins neighbouring properties*
Allowable minimum	:	*2m per MDC requirements*
Available	:	*generally ample room to majority of the area*
Waterways	:	*Nil in proximity*
Stands of trees/shrubs	:	*ample vegetation to site*
Well, bores	:	*none*
Embankment	:	*none*
Building	:	*a future dwelling in proposed to the upper slope of the property adjacent the northern boundary with the ROW*
Other	:	*access tracks have been cut through the property to access the foreshore and with continued maintenance should provide drainage control to mitigate any instability concerns to the sloping location.*
Site history (landuse)	:	*Bush*

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2.3 Site exposure

Site aspect : *North west*
Predominant wind direction : *North west*
Presence of shelter belts : *NA – bush clad site*
Presence of topographical features or structures: *vegetated bush site*

2.4 **Environmental concerns** (eg: native plants intolerant of phosphorus load, high water table, swamp, waters etc): *None*

2.5 Site stability

Is expert assessment necessary?: *Yes/No – the proposed irrigation rate should be insufficient to be problematic to this location.*

If Yes, attach stability statement and give details here of:

Author : *Graham Kerrigan*
Designation : *CP Eng, Chartered Engineer*
Company/agency : *Kerrigan Engineers Limited*
date of report : *Professional opinion on site stability*

2.6 Drainage controls

Depth of seasonal water-table: *No WT present – hill slope*

Winter : -
Summer : -
Episodic : -

Need for cut-off drains/diversion banks: *Runoff from the uphill of the proposed irrigation area is drained with the existing ROW formation*

Need for surface water collector/cut-off drains: none required at this stage

2.7 Availability of reserve/setback areas (show details on sketch plan)

Reserve area available for extensions: *ample hillside is available but unlikely to be required*

% of design area :na

Setback distance (between site development and on-site disposal design and reserve areas) :

2.8 Photographs attached : ~~*Yes*~~*/No* ~~*(specify details)*~~

3.0 SOIL INVESTIGATION

3.1 Soil profile determination

Method : *Test pit and borehole*
Other (specify) : *viewed cutting forming access track and exposing soil profile of irrigation area*

3.2 Reporting (attach detailed soil/report as appropriate, see soil profile information and data sheet, Figure B1): *As attached*

3.3 Estimated soil category (see E4.1 and Table E1)

Summary :

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Site test	1	2	3
Soil category determining DIR/DLR	*Varies between Cat 2- topsoil humus to Cat 3 topsoil loam light clay to Cat 5 medium clay overlaying rotten rock – however the according to the AS/NZ 1547 Standard no account is made of the overlying vegetation in the assimilation of waste and hence the underlying structured clayey silts dictate the design DLR and DIR*		

Remarks :

3.4 Recommended DIR (see 5.2.3.2) *-2.4mm/day*

3.5 Reasons for DLR recommendations : *the soil profile varies with depth topsoil and humus surface material overlaying medium clays. By accounting for the ETS from the vegetation we consider that a 3.5mm/day loading rate will meet the surface loams loading requirements. With the expected ETS from the depth of humus loam topsoil will reduce the permeation to the underlying loamy light clays layer and should suffice to meet the loading requirements for underlying silty medium clays.*
However according to the AS/NZ 1547 Standard no account is made of the overlying vegetation in the assimilation of waste and hence the underlying structured clayey silts dictate the design DIR necessitating a DIR of 30mm/day. Also, due to the steepness of the site and previous determinations from Peer review of other projects with soil profiles and slopes in the area we conclude that a further 20% reduction of DIR is necessary. Hence the determined DIR is 2.4mm/day.

4.0 GENERAL COMMENTS

4.1 Groundwater quality issues: *none applicable*

4.2 Type of land-application system considered best suited to site and why: *Secondary treated waste disposal using Raam irrigation method to vegetated areas.*

4.3 Overall evaluation of minimum land-application area for site: *the significant vegetation of the site provides ETS potential that enables the available areas usage for onsite waste disposal based on the DIR of 2.5mm/day.*

4.4 Results of consultation with other interested parties: *Not required – the property does not immediately abound with neighbouring properties that may be affected by the onsite discharge.*

4.5 4.5 Other comments, for example special precautions which may be needed: *No special precautions are envisaged. The site has reasonably controlled drainage and the conservative discharge rate determined from the standard should not pose any instability concerns.*

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SITE AND SOIL EVALUATION FORM – EXCAVATION LOG

Figure B1 AS/NZS 1547:2012

Client: Paul & Gay Rutherford **Job:** 3597 **Excavation Number:** 1 **Logged By:** G KERRIGAN

Address: 47 Onahau Bay Road, Onahau Bay , Queen Charlotte Sound **Surface Level: R L :** approximate ..... contour

Date of inspection: 10 February 3014

Slope: 15 to 20 degrees **Land form element:** Marlborough Sound formation being geomorphic result of sunken valley **Surface conditions:** Slope varies but generally planer to the south

Indicative drainage: drainage cut off occur resulting from access ROW above the disposal area providing a reasonably controlled drainage,

Surface stones: none evident **Ground cover:** vegetated with regenerating native bush **Watertable depth:** none found – nor expected

Land surface notes: significant vegetation and Evapotranspiration potential **Parent material:** weathered rock

Layer	Lower Depth (mm)	Horizon	Moisture Conditions (See note 2)	Colour (Moist)	Field texture	Coarse Fragments % volume	Structure (see Note 3)	Modified Emersion	Sample Taken (Y/N)	Consistency (see Note 4)	Soil Category	Other assessment
1	200	None applicable	dry	Dark brown	Top soil, vegetative matter	na	Single grained	na	yes	loose	1-2	Significant root content from insitu vegetation
2	200	None applicable	dry	Dark brown	Top soil loam	70%	Single grained	na	yes	loose	3	Significant root content from insitu vegetation
3	Not determined	Underlying silt remnant rock, depth unknown	dry	Light brown	Medium dense silt clay	10%	moderate	na	yes	Very firm	5	Clay horizon dictates DIR per NZ/AS 1547

NOTES:

1 Use another form of >5 layers of major horizons.
2 Dry, moist, very moist, saturated.
3 Apedal (no peds) Either single grain or massive.
Pedal (observable peds) Weak, moderate or strong.
4 Strength – loose, very weak, weak, firm, very firm, strong, very strong, rigid.
Stickiness (when wet) – non, slightly, moderately, very.

Notes/comments/observations:

Layer 1 -The coverage of topsoil and vegetated material of layer 1 is significant and provides ample potential for evapotranspiration of wastes. The DIR may be too high for the underlying layer 3 and an appropriate category representing the potential and limitations of both layers should be used, however NZ/AS 1547 makes no account of vegetation effect so layer 3 category dictates design.

Layer 2 comprises of topsoil loams and light clays . Along with the significant potential of ETS from layer 1 with subsurface irrigation we expect that this DIR defined by the lower layers will be significantly conservative as noted in comment above

Layer 3 – Underlying silt clays being remnant underlying rock. Material is strongly structured and determined as category 5 strongly structured clayey silts

Overall soil category assigned: 5 **Maximum depth of system:** proposed system is a Raam irrigation to surface loams

Soil appears favourable for (list system types): Raam irrigation of secondary treated waste **Checked By:** GCKERRIGAN

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Operations & Maintenance requirements

This appendix suggests what might be useful in O & M Guidelines and provides basic technical information covering operation, maintenance and monitoring of on-site domestic-wastewater systems.

Advice of homeowner/occupier responsibilities

Homeowners and occupiers are legally responsible to keep their on-site wastewater system in good working order. If any of the warning signs outlined in the following are evident, the homeowner or occupier must contact the nearest local authority without delay.

Design information

The proposed system for 49 Onahau Bay Road, Onahau Bay, Queen Charlotte Sound is:

Treatment process :	Secondary treatment using a Natural Flow Eco Waste water sewage system
Land application process :	Raam irrigation following the requirements of AS/NZS 1547:2012

The loading is based on an occupancy of 6 based on the dwelling being 3 bedrooms (per the requirements of MDC guidelines for new on site waste water management systems) and standard usage of 140litre/day/person equating to a daily design volume of 850 l/day.

The soils have been assessed to 2.5mm/day waste loading per Raam surface irrigation requirements to sloped vegetation areas. This loading intensity shall not be exceeded.

The land application system

Effluent from the wastewater-treatment unit receives further treatment by natural processes in the land-application system.

The discharge system is a siphon unit that discharge flow volume to irrigation area two or three times a day at design usage rates. This allows air to return to the soil pores as effluent soaks away between doses.

Advice to a home owner/occupier on use of secondary treatment system

For the on-site wastewater system to work well, there are some good habits to encourage and some bad habits to avoid:

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a. In order to reduce sludge building up in the system:

i. scrape all dishes to remove fats, grease etc, before washing;
ii. keep all possible solids out of the system;
iii. don't use a garbage grinder unless the system has been specifically designed to carry the extra load;
iv. don't put sanitary napkins and other hygiene products into the system.

b. In order to keep the bacteria working in the system and in the land-application area:

i. use biodegradable soaps;
ii. use a low-phosphorus detergent;
iii. use a low-sodium detergent in dispersive soil areas;
iv. use detergents in the recommended quantities;
v. don't use powerful bleaches, whiteners, nappy soakers, spot removers and disinfectants;
vi. don't put chemicals or paint down the drain.

c. Conservation of water will reduce the volume of effluent requiring disposal to the land-application area, make it last longer and improve its performance. Conservation measures include:

i. installation of water-conservation fittings;
ii. taking showers instead of baths;
iii. only washing clothes when there is a full load;
iv. only using the dishwasher when there is a full load.

d. Avoid overloading the system by spacing out water use as evenly as possible.

Advice on maintenance

a. The land-application area needs protection as follows:
i. irrigation areas are not play areas for children and access should be restricted.
ii. The irrigation area utilizes the natural vegetation for evapotranspiration (take up of moisture and nutrients through plants) therefore avoid any pedestrian or other disturbance of the area.
iii. no vehicles or stock should be allowed on trenches or beds;
iv. The irrigation outlet emitters should be checked periodically to ensure that roots from trees or shrubs have not blocked the flow.
v. keep the surface water diversion drains upslope of and around the land-application area clean to avoid absorption of rainwater into to the irrigation field;
vi. the baffles or valves in the distribution system should be periodically (monthly or seasonally) checked to ensure functionality.

b. Check equipment and follow the manufacturers instructions for maintaining and cleaning: pumps, siphons and secondary treatment systems filters.

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Advice on operating problems

The distribution field should be inspected periodically (monthly or seasonally) for any indication of problems.

Problems can occur with systems which have not been maintained and where absorption areas have become blocked or clogged. The warning signs are obvious:

a. Absorption field is wet or soggy with wastewater ponding on the surface of the ground.
b. There is a smell of "sewage" near the septic tank or absorption area.
c. The drains and toilets run slowly.

Advice of the consequences of failure

A failed secondary treatment plant or land-application system is a serious health and environmental hazard and can lead to:

a. Spread of infectious diseases.
b. Breeding of mosquitoes and attraction of flies and rodents.
c. Nuisance and unpleasantness.
d. Pollution and infection of waterways, beaches, streams and shellfish beds.
e. Contamination of bores, wells and groundwater.
f. Alteration of the local ecology.

Further information

Refer any concerns to your maintenance service provider of your secondary treatment system and notify the local Council if issues are potentially a health of environmental hazard.

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OPINION AS TO LAND STABILITY WITH RESPECT TO THE DISCHARGE TO LAND OF SEPTIC WASTE

I **GRAHAM CHRISTOPHER KERRIGAN** hereby confirm that:

I am experienced in the field of soils engineering and more particularly land and foundation stability and am formally recognized by the Marlborough District Council. I am familiar with and understand the purpose of the Marlborough District Council's geo-technical reporting standards. This professional opinion is furnished to the Marlborough District Council regarding slope stability of the property for Mr & Mrs Paul and Gay Rutherford with respect to the proposal to discharge secondary treated septic waste on site at their property at 49 Onahau Bay Road, Onahau Bay, Queen Charlotte Sound.

The following professional opinion is based on the assumption that the data obtained from the reported investigation (refer AS/NZS 1547 :2012 completed forms fig B1,D2 &D3 as appended, project reference 3597) is representative of the disposal area under consideration.

In my professional opinion having examined the site it is reasonable for Council to assume that the data referred to above is representative of the area under consideration.

In my professional opinion, and having regard to the specifics of the site which I have investigated to the extent that acceptable engineering practices require, and with the plans and specifications being made in accordance with acceptable engineering principles and practices and following the recommendations set out in the referenced report, a construction, in accordance with such plans and specifications, will meet proper engineering standards and should not cause slope instability to the disposal area.

G C Kerrigan
MIPENZ(Civil & Structural)CPEng IntPE(NZ)

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