On-site wastewater management report, pt Lot 1 DP 2177, Queen Charlotte Drive, Linkwater

May, 2012

see SUSTAINABLE ENVIRONMENTAL ENGINEERING LTD

On-site wastewater management report, pt Lot 1 DP 2177, Queen Charlotte Drive, Linkwater

Prepared by Mark Davies

Sustainable Environmental Engineering Ltd

6 Pukenui Road

RD 1,

Picton, 7281

EXECUTIVE SUMMARY

Sustainable Environmental Engineering Limited (SEE Ltd) were commissioned by the owners of the site to investigate and evaluate the site conditions and constraints associated with the property in order to design a suitable on-site wastewater management system that complies with Marlborough District Councils 'Guidelines for New On-Site Wastewater Management Systems' and A.S. /N.Z.S. 1547:2000 'On-Site Domestic Wastewater Management'.

This report is for a new wastewater management system to serve a proposed three bedroom residential property on Lot pt Lot 1 DP 2177 in Linkwater in the Marlborough Sounds. The proposed wastewater application area is located on top of a gentle north facing raised terrace to the north of the proposed property. The source of a small unnamed stream is located approximately 55m to the north of the wastewater application area. The best practicable option for on site wastewater management is considered to be primary treatment (septic tank) to pump dosed trenches fitted with LPED.

The desired lateral separation distances between the wastewater application area and the stream and good vertical separation to the underlying aquifer are achievable and a well designed wastewater management system will mitigate against any environmental impact on the local environment. We consider that, given appropriate installation, operation and maintenance, any potential adverse environmental effects will be less than minor.

TABLE OF CONTENTS

1. INTRODUCTION

Under the Marlborough District Council's Marlborough Sounds Resource Management Plan all new discharges of domestic wastewater to land are a discretionary activity and therefore require resource consent. It is essential that the nature of any new on-site wastewater management system is appropriate to the site conditions in order to ensure that all domestic wastewater is treated and contained on-site.

Sustainable Environmental Engineering Limited (SEE Ltd) were commissioned by the owners of the site to investigate and evaluate the site conditions and constraints associated with the property in order to design a suitable on-site wastewater management system that complies with Marlborough District Councils 'Guidelines for New On-Site Wastewater Management Systems' and A.S. /N.Z.S. 1547:2000 'On-Site Domestic Wastewater Management'. Our client is proposing to build a three bedroom dwelling on the western part of the Lot and requires a wastewater management system to serve the dwelling.

2. SITE INFORMATION

2.1 Locality

The property (pt LOT 1 DP 2177) is located on the northern side of the Queen Charlotte Drive close to the township of Linkwater (NZGD E1672456 N5428799), see Figure 1 below and Location Plan A1.0 (Appendix 1). The client proposes to construct a three bedroomed dwelling in the western part of the dwelling. The lots are zoned Rural 2.

Figure 1: The main features of Lot Pt Lot 1 DP 2177

2.2 Site Description

Currently pt LOT 1 DP 2177 comprises of a gently sloping field with large trees in the western part of the site and a small shed/barn in the eastern part of the site. The lot is located on a small, gently sloping terrace (Photo 1) which drops down to a small unnamed stream which flows from east to west approximately 55m to the north of the Lot.

Photo 1: The proposed location of the trenches and the northern boundary of the lot.

2.3 Published geology

The Institute of Geological & Nuclear Sciences, Map 10, describes the underlying deposits in this area as alluvial deposits comprising of well sorted floodplain gravels.

2.4 Climate

Warm, dry and settled weather predominates during summer. Winter days may start with a frost, but are usually mild overall. Typical summer daytime maximum air temperatures range from 20°C to 26°C, but occasionally rise above 30°C. Late winter and early spring is normally the most unsettled time of the year. Typical winter daytime maximum air temperatures range from 10°C to 15°C. The annual rainfall averages between 2000mm and 2500mm per year. Good evapotranspiration rates will exist on site.

2.5 Intended Water Supply

The owner proposes to use a groundwater borehole supply.

3 ON-SITE EVALUATION

3.1 Work Undertaken

An investigation was carried out in accordance with ASNZS 1547:2000 "On-Site Domestic Wastewater Management" and the Marlborough District Council's "Guidelines for New On-Site Wastewater Management Systems". Our investigation included;

- a general visual inspection;
- excavation of test pits to evaluate the soil properties;
- an assessment of the potential environmental effects; and
- a review of previous investigations carried out in this area.

3.2 Topography

The proposed wastewater application area slopes gently (2º to 5 º) to the north and is located on the top of a small stream terrace. The northern edge of the terrace drops down (approximately 2.5m) to the normal flow level of the unnamed stream.

3.3 Site Exposure

The slope of the proposed wastewater application has very good exposure to the sun and wind, is vegetated with established grass and trees providing very good evapotranspiration assistance.

3.4 Surface water

An unnamed stream flows from west to east approximately 55m to the north of the proposed wastewater application area. The proposed application area is not subject to surface water runoff.

3.5 Groundwater

The proposed wastewater application area is located on an elevated river terrace approximately 5m above groundwater providing good vertical separation.

A borehole providing potable water to the property is located on the western side of the property, up gradient of the proposed wastewater application area. The groundwater is said to be drawn from at least 5m below ground level. As the wastewater application area is located down hydraulic gradient of the borehole and there is good vertical separation to the underlying aquifer the risk of the borehole being affected is considered to be very low.

3.6 Environmental Concerns

The lateral and vertical separation distances between the waste water application area and the unnamed stream and aquifer will mitigate against any environmental impact on the local environment.

3.7 Site Stability

The Marlborough Sounds Resource Management Plan does not identify the site as being unstable. No stability issues are apparent on site. The small terrace appears stable with no obvious slumping. The risk of the wastewater discharge initiating instability on site is considered to be very low.

3.8 Drainage Controls

The proposed application area is not subject to surface water runoff and no drainage controls are required.

3.9 Availability of Reserve Areas

A 100% reserve area has been allocated and is located to the eastern side of the proposed application area.

4. SOIL INVESTIGATION

A soil investigation was carried out in accordance with ASNZS 1547:2000 "On-Site Domestic Wastewater Management" and the Marlborough District Council's "Guidelines for New On-Site Wastewater Management Systems". Refer to the site notes in Appendix 2.

4.1 Soil Profile

Three test pits were excavated by a spade/auger to a maximum depth of 1.2m below ground level (bgl) and the soil profile logged.

The soil profile of the test pits comprised of 200 to 250mm of dark brown, organic rich, slightly moist, silty clay loam topsoil over a brown, slightly moist, stiff to very stiff, occasionally sandy, silty clay loam. Refer to the site notes and logs in Appendix 2.

4.2 Estimated Soil Category

Ribbon length tests were undertaken on samples from the silty clay loam soil horizon. The soil had a ribbon length that varied from 35mm to 50mm. The ribbon lengths, physical nature of the soil and rate of drying of the soil indicate that the soil is Category 4 silty clay loam.

5. DESIGN

Wastewater application systems should be kept shallow to make maximum benefit of evapotranspiration and biological activity in the upper soil.

5.1 Loading

The design wastewater loading was based on the Marlborough District Council's "Guidelines for New On-Site Wastewater Management Systems for Households with Standard water reduction fixtures" which include a 11/5.5 dual flush wc, shower flow restrictors, aerator taps, and water conserving automatic washing machine. The proposed dwelling will have a borehole supply. We have therefore allowed for total per capita flow of 145 L / person / day.

The design wastewater loading for the proposed residential dwelling is therefore 6 persons at 145 L / person / day i.e. 870 litres / day. See Attached design sheet in Appendix 3.

5.2 Proposed Effluent Treatment System

A number of effluent treatment systems have been considered including primary and secondary treatment to trenches and a bed. There are no environmental concerns in the area and secondary treatment is not considered necessary. Treatment of all waste in a single septic tank (See Drawing C01 in Appendix 1) will be adequate at this site. The tank should be sized to cater for peak loading and for a minimum of 24 hours residence time. A minimum tank size of 4500 litres is recommended. The fitting of an approved effluent filter to the outlet of the tank is required to prevent solids exiting the tank, to improve treatment performance and to the buffer peak flows.

5.3 Land Application System

5.3.1 Land Application Options

A number of potential wastewater land application options for the site have been assessed taking into consideration the underlying geological, hydrogeological and wider environmental conditions. Primary treatment to trenches and a bed with Low Pressure Effluent Distribution (LPED) were reviewed. Due to the large available space, soil type and lack of environmental constraints the most appropriate land application system in this location is considered to be primary treatment to trenches with LPED.

This system involves nesting a small perforated uPVC pipeline within larger slotted pipe work laid within aggregate, which helps to evenly distribute effluent throughout the trenches and onto the surface of the soil which provides further treatment.

The depth of unsaturated Category 4 soil beneath the proposed wastewater application field exceeds Marlborough District Council's requirements of 600mm for primary treated effluent and will therefore provide excellent treatment.

5.4 Recommended DLR

For primary treated effluent to trenches underlain by Category 4 silty clay loam soil, a Design Loading Rate (DLR) of 14mm per day should be used (see site specific DLR calculation sheet - Appendix 3).

5.5 Detailed Design

The proposed wastewater application area is sited on the top of the terrace in the western part of the Lot (see Drawing A1.0 in Appendix 1).

For a total daily flow of 870L/person/day and a Design Loading Rate (DLR) of 14mm, 104m of trenches are required.

5.6 Distribution

The four trenches will each measure 26m long and 600mm wide with a separation distance between trenches of 1m. The effluent to the trenches will be pump dosed from the pump chamber (see Drawing C02 in Appendix 1) via a rising main to a two sequencing valve. The main from the sequencing valve will centrally feed the lateral distribution pipe work. The 90mm (min) distribution pipe work will have 6mm saw cut holes spaced every 150mm in the bottom of the pipe work. The internal pipe work (23.95mm ID) will have 3.5mm holes spaced every 1.5m. Drawing C03 (Appendix 1) sets out the design details.

The effluent will be pumped through the pipework ensuring even loading throughout the land application area. The pump chamber should be sized for a dose load of 216 litres and have an emergency storage capacity equal to the maximum daily load of 870 litres, making a total chamber size of 1086 litres minimum. The pump should be capable of achieving 15m head and at least 80 litres/minute flow. This assumes an elevation head of 2m from the primary treatment system to the wastewater application area. The elevation head should be checked on site prior to ordering the pump.

5.7 Installation, operation and maintenance

Sustainable Environmental Engineering Ltd have undertaken a site investigation and designed a Wastewater application system in accordance with current Marlborough District Council and New Zealand codes and modern practice.

Appropriate operation and maintenance of the wastewater system is critical to its overall performance. The system should be serviced annually by a trained service technician and records sent to Marlborough District Council. The designer will inspect the pipe work prior to it being covered and undertake a pre-commissioning water test of the whole effluent field, to ensure that the system is working correctly prior to it being signed off. Construction of the trenches will be carried out in strict compliance with the designers drawing (Drawings C01, C02 and C03 Appendix 1)) and report details. Any deviations will be notified and agreed to by SEE Ltd and Marlborough District Council before proceeding.

Written instruction detailing the operation of the complete system will be provided to the owner by the installer or agent on completion of installation.

6. ASSESSMENT OF ENVIRONMENTAL EFFECTS

The construction of a new wastewater system within the Marlborough Sounds Resource Management Plan is a Discretionary Activity. The following criteria will ensure that any potential adverse effects on the environment will be mitigated against

(a) The wastewater discharge has been located as far as practical away from any surface water and groundwater and is at least 55m from the unnamed stream and 5m above the water table. The land application area is not subject to flooding.

(b) There are no other properties directly down slope to the stream, and the closest other (potential) land application system is at least 30 m away.

(c) The proposed treatment system and lateral and vertical separation distances between the wastewater application area and the unamed stream will ensure that the discharge will not adversely affect the water quality of the stream or groundwater.

(d) The land is gently sloping and there are no instability issues. The application of wastewater on the site will not initiate any surface instability.

(e) The proposed on-site system complies with current Marlborough District Council and New Zealand guidelines.

(f) The site characteristics, design guidelines, assessment of alternatives and management proposals have been fully investigated and have been described in Sections 4 and 5 in this report.

(g) The discharge will not create offensive or objectionable odour or adversely affect the amenity values enjoyed on adjoining properties.

The desired lateral and vertical separation distances between the waste water application area and the stream and groundwater and a well designed wastewater application area will mitigate against any environmental impact on the local environment.

We consider that, given appropriate installation, operation and maintenance, any potential adverse environmental effects will be less than minor.

7. REFERENCES

ARC Environment, Technical Paper No. 58, Third Edition 'On-Site Wastewater Disposal from Households and Institutions'.

A.S./N.Z.S. 1546.1:2008 'On-Site Domestic Wastewater Treatment Units, Part 1: Septic Tanks.

A.S./N.Z.S. 1547:2000 'On-Site Domestic Wastewater Management'.

Centre for Environment Training 'On-Site Wastewater Management Training Course', Christchurch 2001.

Crites, R and Tchobanoglous, A (1998). 'Small and Decentralized Wastewater Management Systems'.

Marlborough District Council (11 July 2005) 'Guidelines for New On-Site Wastewater Management Systems'.

Marlborough Sounds Resource Management Plan.

Disclaimer

This report has been prepared solely for the benefit of you as our client and the relevant Local Authority with respect to the particular brief given to us, and data or opinions contained in it may not be used in other contexts or for any other purpose without our prior review and agreement.

This disclaimer shall apply notwithstanding that the report may be made available to any other person in connection with any application for permission or approval, or pursuant to any requirement of law.

This report is based on conditions found on site at the time of the site investigation and is consistent with standards currently being applied. The soil sampling undertaken provides an understanding of the conditions present but conditions may vary considerably over relatively small areas due to the nature of the site and the contamination.

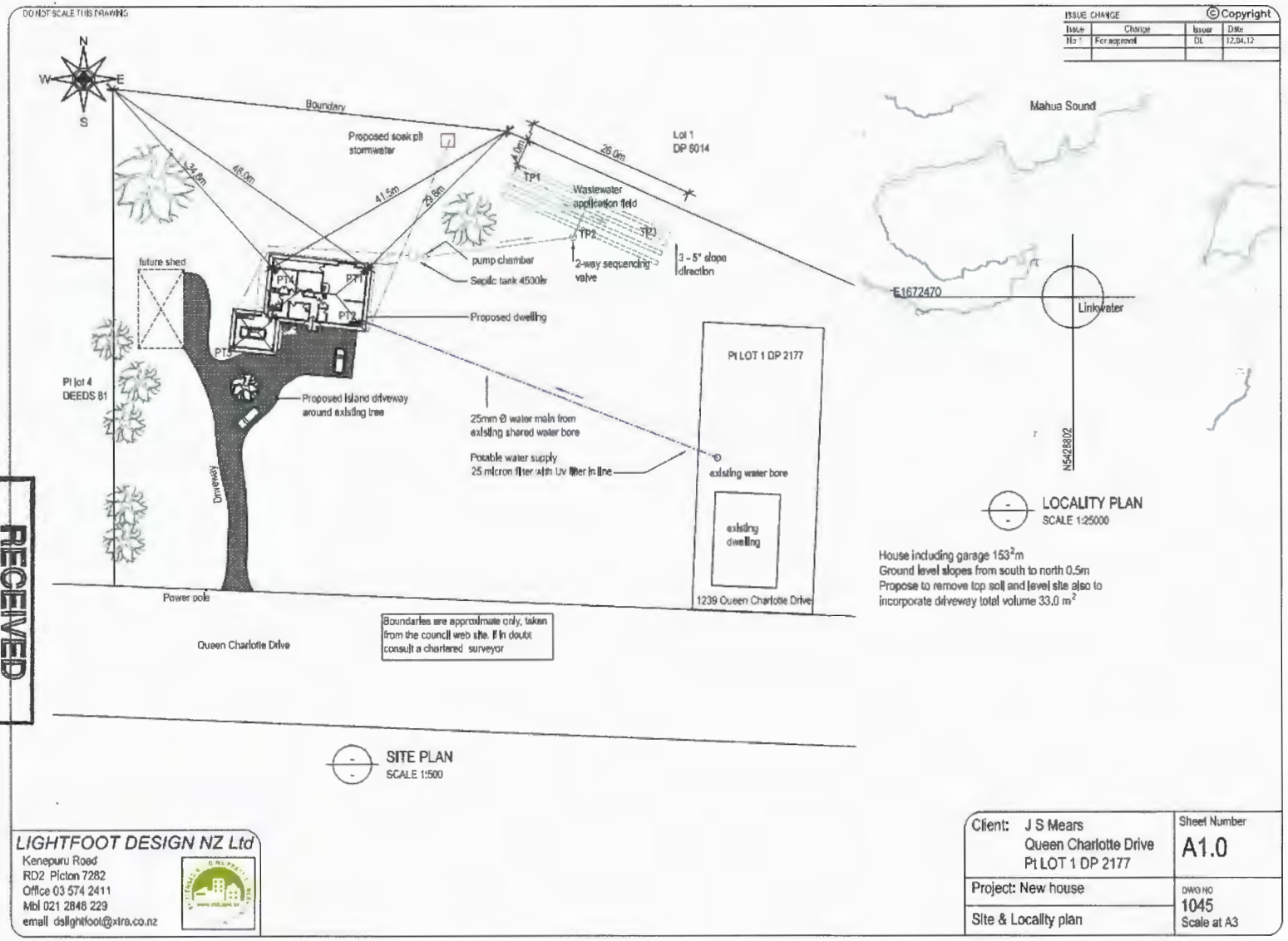
Where data supplied by the client or other external sources, including previous site investigation data, have been used, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted by SEE Ltd for incomplete are inaccurate data supplied by others.

Mark Davies

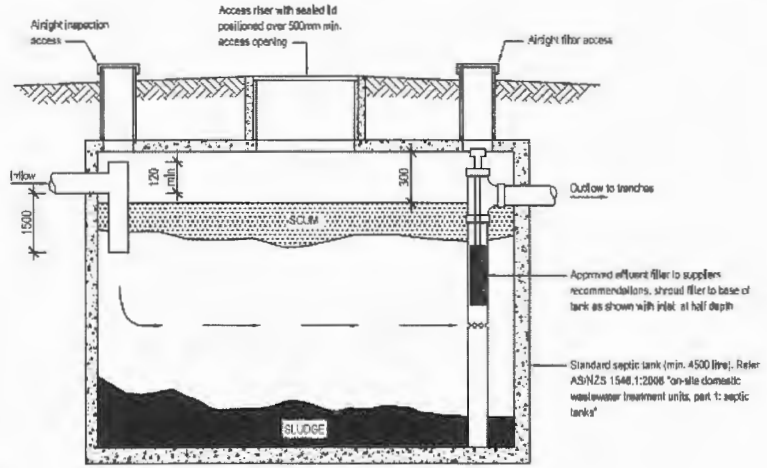
SEE Ltd

APPENDIX 1

Drawings:	A1.0	Site Location and Plan
	C01	Septic Tank
	C02	Pump Chamber
	C03	Trench Details



DO NOT SCALE THIS DRAWING



CROSS SECTION SEPTIC TANK TYP
SCALE 1:100

ISSUE CHANGE

Issue No	Change	Issuer	Date
1	For approval	DL	26.04.12

OPERATION AND MAINTENANCE SEPTIC TANK

1.) The inflowing household sewage should not contain anything other than human waste and toilet paper, and food material such as may go down a kitchen sink drain. garbage grinders are not recommended, although they need not be forbidden, more frequent desludging of the septic tank may be needed if a garbage grinder is used, normal use in the house of soaps, detergents, bleaches, plumbing fixture cleaners, drain cleaners and disinfectants will not harm the functioning of the septic tank or the soil absorption system.

2.) Prohibited discharges to the septic tank include:
oil/grease from e.g. a deep frier.
stormwater and any drainage other than sewage generated in the house.
petrol, oil, and other flammable/explosive substances.
household, garden, garage, and workshop chemicals (e.g. pesticides, paint cleaners, photographic chemicals, motor oil and trade waste).
disposable nappies and sanitary napkins.

3.) Septic tanks need to be pumped (septage removed when the sludge and scum have accumulated to the extent that the clear space (between scum and sludge) has a volume less than 1500 litres). septage removal may need to be done as often as every three years but at no longer than five year intervals.

EFFLUENT FILTER

1.) THE OUTLET FILTER SHOULD PREVENT DISCHARGE OF SUSPENDED PARTICLES > 3mm AND ENSURE TSS < 100g/m ^{3}.

2.) THE SEPTIC TANK SHOULD BE PUMPED PRIOR TO REMOVAL OF THE FILTER TO PREVENT ANY SOLIDS FROM ESCAPING TO THE TRENCHES WHEN THE CARTRIDGE IS REMOVED.

3.) THE FILTER SHALL BE CLEANED AT THE SAME TIME AS THE NORMAL SEPTIC TANK SERVICING (3-5 YEARS).

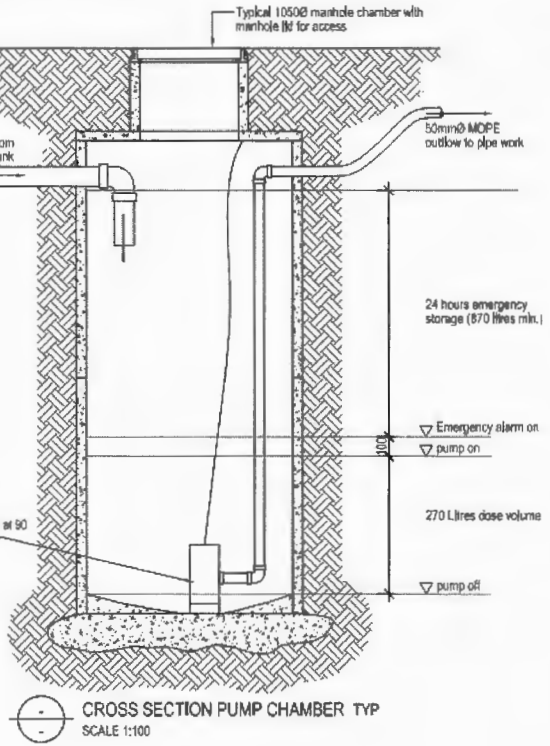
4.) REMOVE THE CARTRIDGE AND RINSE OFF WITH A GARDEN HOSE. BEING CAREFUL TO RINSE ALL SEPTAGE MATERIAL BACK INTO THE TANK.
IT IS NOT NECESSARY THAT THE CARTRIDGE BE CLEANED "SPOTLESS".
THE BIOMASS GROWING ON THE FILTER AIDS IN THE PRE-TREATMENT PROCESS AND SHOULD BE LEFT ON THE CARTRIDGE.

LIGHTFOOT DESIGN NZ Ltd
Kenepuru Road
RD2 Picton 7282
Office 03 574 2411
Mbl 021 2848 229
email dslightfoot@xtra.co.nz

see SUSTAINABLE ENVIRONMENTAL ENGINEERING LTD

Client: J S Mears Queen Charlotte Drive Pt LOT 1 DP 2177	Sheet Number C01
Project: Septic system details	DWG NO 1045
Details	Scale at A3

DO NOT SCALE THIS DRAWING



CROSS SECTION PUMP CHAMBER TYP
SCALE 1:100

NOTES:

1.) Materials and installation of wastewater system to be in accordance with AS/NZS 1546.1:1998, AS/NZS 1547:2000 and manufacturers specification.

2.) Pump chamber to be fitted with a high level float set just above normal operating level, wired to audio and visual alarms.

3.) Pump chamber shown is an example only, other types could be approved, e.g. modified septic tank.

4.) Operation of distribution system to be fully tested prior to coverage of pipework, engineer to be present.

5.) Confirm head to wastewater application area valve prior to ordering pump.

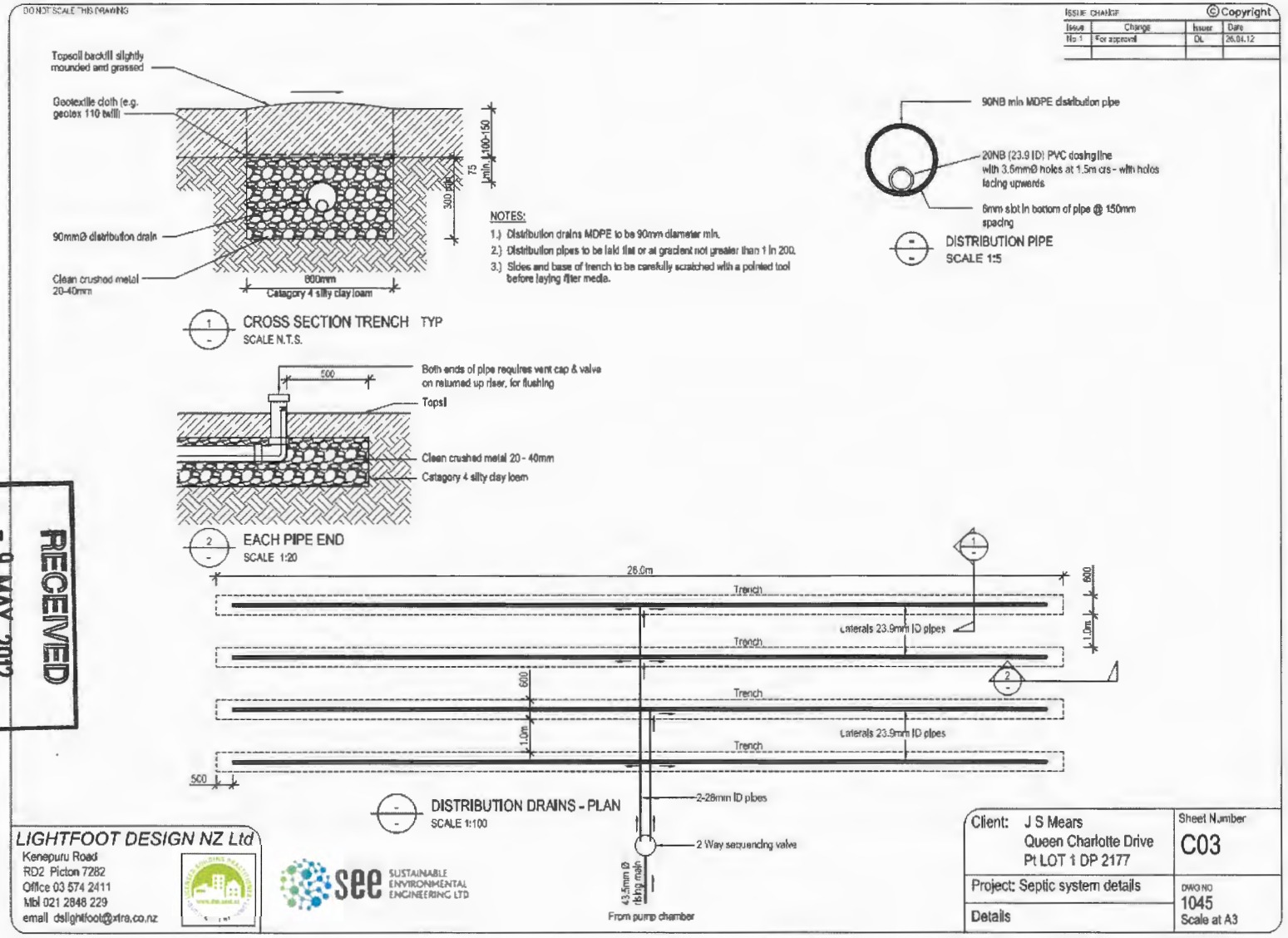
ISSUE CHANGE

Issue	Change	Issuer	Date
No 1	For approval	DL	26.04.12

LIGHTFOOT DESIGN NZ Ltd
Kenepuru Road
RD2 Picton 7282
Office 03 574 2411
Mbl 021 2848 229
email dslightfoot@xtra.co.nz

see SUSTAINABLE ENVIRONMENTAL ENGINEERING LTD

Client: J S Mears Queen Charlotte Drive Pt LOT 1 DP 2177	Sheet Number C02
Project: Septic system details	DWG NO 1045
Details	Scale at A3



APPENDIX 2

Site and Soil Evaluation Form

Site and Soil Evaluation Form

Job Number and Project Name	WW001
Clients Name	Mears
Client Address Details	Linkwater
Lot Number	pt LOT1 DP2177
Date Inspected	April 2011
Weather	Overcast, little wind

Description of Wastewater Application area

WAA Location	On raised terrace to north of house.	
Slope angle and direction	3° to 5 ° north	
Ground cover	Vegetated	
Vegetation	Grass	
Nearby water bodies	Unnamed stream	Separation Distance 55m
Nearby boreholes/wells	House borehole	Separation Distance 40m
Stability Considerations	None	
Depth to Groundwater	+5m	
Signs of runoff	None	
Reserve area available	Yes	
Comments	Due to the nature of the site the most appropriate location for the WAA is on top of the raised terrace. This gives the good lateral separation from the WAA to the stream and very good vertical separation. The site will suit primary treatment to trenches.	

Test Pits – Soil profile

Test Pit 1 – Spade and Auger							
Layer	Lower Depth mm	Colour	Organic content	Moisture	Strength or density	Soil texture – minor fraction	Soil texture – Major fraction
A	200	Dark brown	Organic rich	Slightly moist	Stiff to very stiff	Silty clay loam	topsoil
B	1200	Brown	-	Slightly moist	Very stiff	Silty clay	loam

Test Pit 2 – Spade and Auger							
Layer	Lower Depth mm	Colour	Organic content	Moisture	Strength or density	Soil texture – minor fraction	Soil texture – Major fraction
A	250	Dark brown	Organic rich	Slightly moist	Stiff to very stiff	Silty clay loam	topsoil
B	1200	Brown	-	Slightly moist	Very stiff	Silty clay with minor fractions of sand	loam

Test Pit 3 – Spade and Auger							
Layer	Lower Depth mm	Colour	Organic content	Moisture	Strength or density	Soil texture – minor fraction	Soil texture – Major fraction
A	200	Dark brown	Organic rich	Slightly moist	Stiff to very stiff	Silty clay loam	topsoil
B	1000	Brown	-	Slightly moist	Very stiff	Silty clay with minor fractions of sand	loam

Ribbon Length Tests

Test Pit 1 - Ribbon Length Tests								
Soil layer	% coarse fragments > 2mm	Soil Texture	Plasticity when wet	Does soil feel smooth or gritty	Ribbon Length (mm) Test 1	Ribbon Length (mm) Test 2	Ribbon Length (mm) Test 3	Soil Category
Layer B	<3%	Silty clay loam	Moderatel y plastic	smooth	45	50	50	Category 4 silty clay loam

Test Pit 2 - Ribbon Length Tests								
Soil layer	% coarse fragments > 2mm	Soil Texture	Plasticity when wet	Does soil feel smooth or gritty	Ribbon Length (mm) Test 1	Ribbon Length (mm) Test 2	Ribbon Length (mm) Test 3	Soil Category
Layer B	<3%	Silty clay loam	Moderatel y plastic	smooth	45	55	50	Category 4 silty clay loam

Test Pit 3 - Ribbon Length Tests								
Soil layer	% coarse fragments > 2mm	Soil Texture	Plasticity when wet	Does soil feel smooth or gritty	Ribbon Length (mm) Test 1	Ribbon Length (mm) Test 2	Ribbon Length (mm) Test 3	Soil Category
Layer B	<3%	Silty clay loam	Moderatel y plastic	smooth	45	45	50	Category 4 silty clay loam

APPENDIX 3

Wastewater Design Sheet

SUSTAINABLE ENVIRONMENTAL ENGINEERING LTD

Wastewater design sheet

Client	Mr Mears
Location	Linkwater
Designer	MTD
Date	April 2012

Households with Standard water reduction fixtures				
Appliance/Fixture per Person Daily allowance				
Toilet 11/5.5 dual flush wc	Water Conserving Automatic Washing Machine	Shower with flow restrictors	Basin (kitchen, bathroom, laundry) with aerator taps	Total per Capita Flow (l/p/d)
40	**20**	**65**	**20**	**145**

Design wastewater flow per person per day (l/p/d)	**145**
No of Bedrooms	**3**
Equivalent Occupancy	**6**
Design Daily Wastewater Allowance (l/d)	**870**

Primary Treatment	Yes	
Soil Category	4	
Design Loading Rate	14	mm/day
Design Daily Allowance l/day	870	l/day
Trench requirement (min)	104	m (min)
Number of trenches	4	
Trench Depth	400	mm
Trench Length	26	m
Trench Width	600	mm

REFERENCES :
ARC TP # 58 Third Edition
AS/NZS 1547:2000 "On Site Domestic Wastewater Management"
MDC,11 July 2005,"Guidelines for New On -Site Wastewater Systems"

Site Specific Design Loading Rate - calculation sheet

Soil Category 4 Silty clay loam

DLR (Design Loading Rate) site specific factors

Site Specific Factors	0	1	2	SCORE	WEIGHT	RANKING
Slope angle	> 20°	10-20°	0-10°	2	3	6
Exposure to sun	low	mod	high	2	3	6
Exposure to wind	low	mod	high	2	3	6
Depth of topsoil	<100 mm	100-200	>200 mm	2	2	4
Suitability of vegetation	not suit.	suitable	v. suitable	2	3	6
Proximity to surface water or boreholes	<10 m	10-30	>30 m	2	2	4
Depth to groundwater	<1 m	1-2	>2 m	2	3	6
Wastewater & environmentally related problems in area ?	yes	unsure	no	2	2	4
Nearby wastewater systems?	yes	unsure	no	2	1	
Trench width	>400 mm	300-400	<300 mm	0	1	0
Distribution method	gravity	dose	LPED/drip	2	3	3
Frequency of use	permanent	frequent	infrequent	0	3	0
OVERALL RANKING SCORE						**46**

DLR (ex Table 4.2.A1)			RANKING
Minimum rate	10	mm/day	<25
Maximum rate	15	mm/day	>50

DLR considered appropriate for the site **14** **mm / day**

Proposed Trench Dimensions

width 600 mm

depth 300 mm (below topsoil layer)

Trench Length, L (min.) = (Daily Flow)/(DLR x width)

= **104.0** **m**

Let trench length be **104** **m**