On-site wastewater management report, 2329 Queen Charlotte Drive, Ngakuta Bay

October, 2012

see SUSTAINABLE ENVIRONMENTAL ENGINEERING LTD

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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. 1547:2012 'On-Site Domestic Wastewater Management'.

This report is for a new wastewater treatment and application system to serve a two/four bedroom residential property on Lot 14 DP 1513 in the settlement of Ngakuta Bay in the Marlborough Sounds. The proposed wastewater application area is located on a gentle north facing slope to the south of the proposed property. The best practicable option for on site wastewater management is considered to be secondary treatment to a pump dosed raised bed fitted with LPED.

The desired lateral separation distances between the wastewater application area and the stream and Queen Charlotte Sound 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.

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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. 1547:2012 'On-Site Domestic Wastewater Management'. The current wastewater system (3000L septic tank to soak pit) does not meet the current guidelines and requires an upgrade.

The owner proposes to demolish the northernmost dwelling on site and construct a '2 bedroom bunkroom' to the south of the dwelling that will remain on site. The size of the footprint of the 'bunkroom' will be the same size as the aforementioned dwelling being demolished. In the future the owner of the site proposes to add two further bedrooms to the existing dwelling/bunkroom, making four bedrooms in total. In order to future proof the system the owner wishes to construct a new wastewater management system (secondary treatment to a raised bed) capable of dealing with wastewater from four bedrooms. The secondary treatment system will greatly improve any potential environmental effects on the local environment.

2. SITE INFORMATION

2.1 Locality

The property (LOT 14 DP 1513) is located at the eastern end of the settlement of Ngakuta, close to the Queen Charlotte Sound (NZGD E1680834 N5430297), see Figure 1 below and Location Plan C1 (Appendix 1). The lot is zoned Sounds residential.

Figure 1: The main features of Lot 14DP 1513

2.2 Site Description

Currently the Lot (LOT 14 DP 1513) comprises of a rectangular, grassed area that gently slopes in a northerly direction towards Ngakuta Bay in the Queen Charlotte Sound. A small stream flows from south to north alongside the western boundary of the Lot. Currently there are two dwellings and a garage on site. The owner proposes to demolish the northernmost dwelling on site and construct a '2 bedroom bunkroom' to the south of the dwelling that will remain on site. In the future, the owner proposes to extend the existing dwelling adding a further two bedrooms, making four bedrooms in total. The primary treatment system currently serving the dwelling (septic tank to soak pit) is located to the north of the northernmost dwelling.

2.3 Published Geology

The Institute of Geological & Nuclear Sciences, Map 10, describes the underlying deposits in this area as alluvial fan deposits comprising of poorly sorted gravels overlying Marlborough Schist comprising of metamorphosed well to poorly bedded grey to green grey sandstone/siltstone.

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 dwelling is supplied by the Ngakuta community water system.

3 ON-SITE EVALUATION

3.1 Work Undertaken

An investigation was carried out in accordance with ASNZS 1547:2012 "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 is located to the south of the proposed dwelling on north, gently (2° to 5 °) facing slopes.

3.3 Site Exposure

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

3.4 Surface water

A small unnamed stream flows south to north along the eastern side of the lot. The Queen Charlotte Sound is located approximately 25m north of the northern boundary of the Lot. The Marlborough District Council has

identified the Lot as being in a natural hazard zone for flooding. The owner and neighbours indicate that the Lot has not flooded for approximately 20 years.

3.5 Groundwater

The proposed wastewater application area is not located over any useable aquifers.

3.6 Environmental Concerns

Secondary treatment of the wastewater and a well designed wastewater application area will mitigate against any environmental impact on the local environment.

3.7 Site Stability

The northernmost part of the Lot is identified as being in the Marlborough Sounds Resource Management Plan natural hazard zone for instability. The proposed wastewater application area is located on very gentle north facing slopes which are not in the hazard zone and show no stability issues. The slopes are vegetated with grass. The risk of the wastewater discharge initiating instability on the proposed area is considered to be very low.

3.8 Drainage Controls

The wastewater application area will be raised slightly above ground level so that any potential surface water cannot enter the wastewater application area.

3.9 Availability of Reserve Areas

A 100% reserve area has been allocated and is located on the northern side of the proposed wastewater 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 1m below ground level (bgl) and the soil profile logged.

The soil profile of the test pits comprised of 100 to 150mm of dark brown, organic rich, slightly moist, slightly sandy, silty clay, loam topsoil over a 100mm to 150mm of brown, slightly moist, soft to firm, slightly clayey silty fine sand. Underlying the clayey silty fine sand was a brown, poorly sorted, silty fine sand with sub angular to angular gravel with clasts varying from 5mm through to 35mm. Refer to the site notes and logs in Appendix 2.

4.2 Estimated Soil Category

The soil underlying the site represents a heterogeneous mix of silty fine sand to silty fine sand with gravel. The gravel varied in size from 5mm through to 20mm and was sub angular to sub rounded. Ribbon length tests were performed on the silty fine sand. The ribbon lengths varied from 15mm through to 25mm. The visible sand, coherent nature of the ball and ribbon lengths indicates that the soil is a Category 2 sandy loam. However the gravel nature of the soil dominates in parts, greatly increasing the permeability of the soil, therefore the soil should be rated Category 1.

The treatment capacity of the soil and not the hydraulic capacity of the soil or the growth of the clogging layer govern the effluent loading rate for Category 1 and weakly structured Category 2 soil. Land application systems in these soils require distribution techniques to help achieve even distribution of effluent over the full design surface. These soils often have low nutrient retention capacity often allowing accession of nutrients to groundwater. ASNZS 1547:2012 recommends specific treatment techniques to help achieve even distribution of effluent over the full design surface.

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 fixtures" and the ASNZS 1547:2012 "On-Site Domestic Wastewater Management" guidelines.

The design wastewater loading was based on the loading from 4 bedrooms/8 people. The proposed dwelling has a community stream water supply. Due to restrictions on space on site we have allowed for an 11/5.5 dual flush wc and have therefore reduced the daily flow from the recommended 200L/person/day to 180L/person/day.

The design wastewater loading for the proposed residential dwelling is therefore 8 persons at 180 L/person/day i.e. 1440 litres / day. See Attached design sheet in Appendix 3.

5.2 Proposed Effluent Treatment System

Secondary treatment systems are designed to substantially degrade the biological content of the effluent to an acceptable level for land application and a number of systems exist including ones using media/textile filters, aeration and vermiculture. The client proposes to install a Biolytix secondary wastewater system or something similar that meets the Marlborough District Council requirements. Any changes to the proposed secondary wastewater treatment system will be presented to Marlborough District Council for review. A written specification and drawings (produced by the producer) are attached in Appendix 4.

5.3 Land Application System; 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. Secondary treatment to trenches, a raised bed with Low Pressure Effluent Distribution (LPED) and drip irrigation were reviewed. The most appropriate land application system in this location is considered to be secondary treatment to a raised bed fitted with LPED pipe work. As the underlying ground is silty sand with gravel the bed will be designed in a similar way to a discharge control trench (ASNZS 1547 - 2012 Figure L4).

5.4 Recommended Design Loading Rate (DLR)

For secondary treated effluent to a bed over a Category 1 or 2 soil a Design Loading Rate (DLR) of 50mm per day should be used (see Appendix 3).

5.5 Detailed Design

The proposed wastewater application area is sited on a gently sloping area to the south of the dwelling (see Drawing A-02a and C2.0 in Appendix 1). For a total daily flow of 1440L/person/day and a Design Loading Rate (DLR) of 50mm, a bed area measuring 29m² is required.

5.6 Distribution

A single bed of 7.5m by 4m (total area 30m²) could be installed in the southern part of the Lot allowing for an offset of 2m from the eastern boundary which is the minimum distance required by Marlborough District Council. The bed will be orientated east/west across the site, 2m from the eastern boundary of the site. The western end of the bed will be approximately 16m from the stream; however the treated effluent draining from the base of the bed is likely to run in a northerly direction down hill, adjacent to the stream. The beds placement is unlikely to have a detrimental impact on the local environment, neighbouring properties or the stability of the land.

The raised bed will be divided into two main areas which will be identical. One half of the area will be used for the initial two bedroom dwelling. The second area will be used if and when the building is further extended to four bedrooms. A valve will be used to separate the two areas which will be able to be switched on when required.

The effluent to the bed will be pump dosed via a rising main. The rising main will centrally feed the lateral distribution pipe work which will be laid out 2m apart and have 4.5mm holes spaced every 0.5m. Drawing C2.0 sets out the design details. The effluent will be pumped through the pipework ensuring even loading throughout the land application area.

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 bed will be carried out in strict compliance with the designers drawing (Drawings A-02a, and C2.0 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 raised bed has been located as far as practical away from any surface water and is raised to minimise the impact from any potential flooding. The owner and neighbours indicate that the Lot has not flooded for approximately 20 years.

(b) There are no other properties directly down slope to the Queen Charlotte Sound, and the closest other (potential) land application system is at least 20m to the east on a similar level.

(c) The proposed treatment system and lateral separation distances between the wastewater application area and the stream and Queen Charlotte Sound will ensure that the discharge will not adversely affect the water quality of either of the watercourses.

(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 separation distances between the waste water application area, the stream and the Queen Charlotte Sound; secondary treatment; 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.

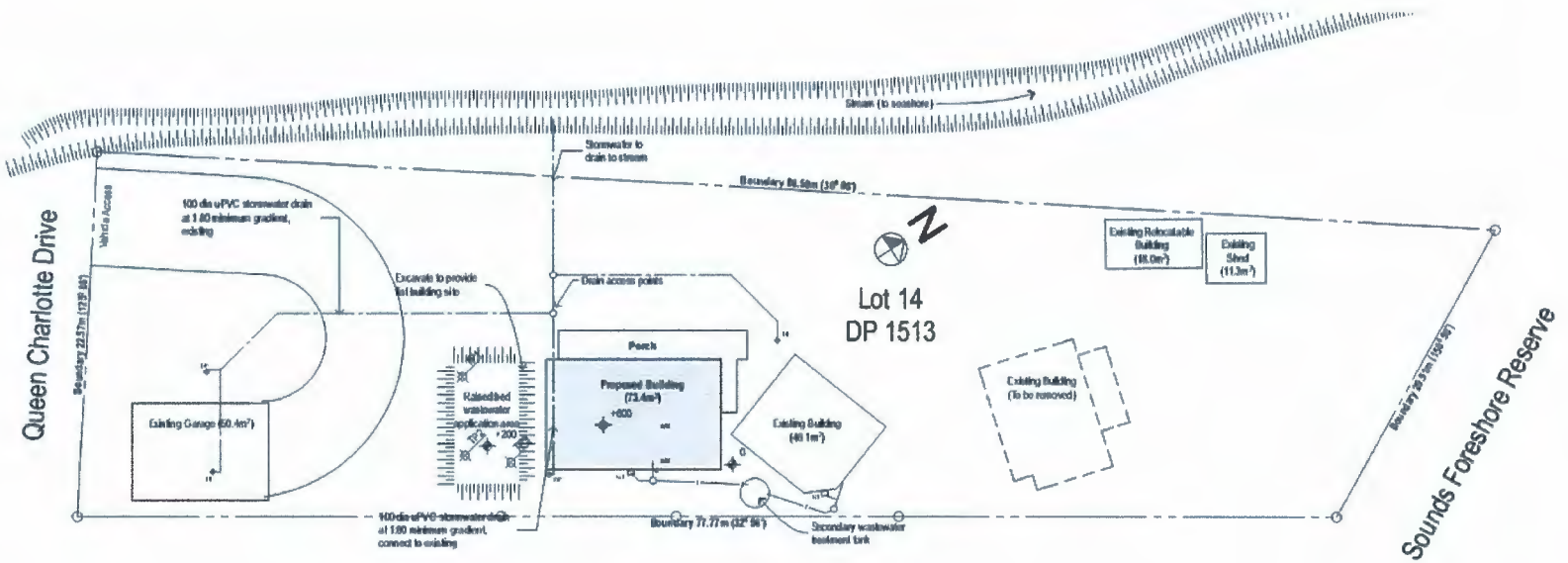
Where data supplied by the client or other external sources, including previous site investigation data, have been used, it has been assumed that the information is correct unless otherwise stated. No responsibility is accepted by SEE Ltd for incomplete are inaccurate data supplied by others.

Mark Davies

SEE Ltd

APPENDIX 1

Drawings:	A-02a	Site Location and Plan
	C2.0	Bed details



Site & Drainage Plan
Scale 1:250

RECEIVED
25 JAN 2013
MARLBOROUGH DISTRICT COUNCIL

Design HQ
www.designhq.co.nz
26A Bamford Street PO Box 442 Blenheim
Tel 03 577 5567 Mob 021 775 367 Fax 03 577 5568

Project Description	New Bunkroom
Project Number	10465
Client	Ian & Margaret Williams
At	2329 Queen Charlotte Drive Ngakuta Bay
NOTES	

Rev	Description	Date

Technician	NF
Designer	AGF
Creation Date	2/04/2012
Plot Date	18/01/2013
Project Status	Building Consent
Scale (at A3)	1:250
Revision	Date 18/01/2013

Drawing Title: Revised Site Plan
Drawing Number: A-02a of 14

ALL DIMENSIONS TO BE VERIFIED ON SITE

DO NOT SCALE THIS DRAWING

NOTES:

1.) Engineer to inspect distribution pipework & undertake pre-commission test prior to Pipework being covered with top soil.
2.) Distribution of bed pipework to be laid level.
3.) Animals & vehicles to be kept off the raised bed area.

ISSUE CHANGE			© Copyright
Issue	Change	Issuer	Date
No 1	For approval	DL	07.11.12

PLAN
SCALE 1:100

SECTION
SCALE 1:50

DETAIL
SCALE 1:20

DISTRIBUTION PIPE
SCALE 1:5

LIGHTFOOT DESIGN NZ Ltd
Kenepuru Road
RD2 Picton 7282
Office 03 574 2411
Mbl 021 2848 229
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SEE SUSTAINABLE ENVIRONMENTAL ENGINEERING LTD

Client: Ian Williams 2329 Queen Charlotte Drive Ngakuta Bay	Sheet Number C2.0
Project : Wastewater	DWG NO SEE 20
Discharge Control Raised Bed	Scale at A3

APPENDIX 2

Site and Soil Evaluation Form

Site and Soil Evaluation Form

Job Number and Project Name	WW001
Clients Name	Williams
Client Address Details	Ngakuta Bay
Lot Number	LOT14 DP 1513
Date Inspected	October 2012/January 2013
Weather	Overcast, little wind

Description of Wastewater Application area

WAA Location	Close to eastern boundary of lot, south of the proposed dwelling	
Slope angle and direction	2° to 5 ° north	
Ground cover	Vegetated	
Vegetation	Grass	
Nearby water bodies	Queen Charlotte Sound	Separation Distance 125m
	Stream	Separation Distance 17m
Nearby boreholes/wells	N/A	
Stability Considerations	None	
Depth to Groundwater	+1m	
Signs of runoff	None	
Reserve area available	Yes	
Comments	Due to the nature of the site the most appropriate location for the WAA is close to the eastern boundary of the Lot, south of the dwelling. This provides a good area for the raised bed and provides the required lateral separation distances from the WAA to the stream and Queen Charlotte Sound. The site will suit secondary treatment to a raised bed fitted with LPED.	

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	100 to 150mm	Dark brown	Organic rich	Slightly moist	Soft to firm	Slightly sandy, silty clay loam	topsoil
B	300mm	Brown	-	Slightly moist	Soft to firm	Slightly clayey silty	Very fine to fine sand
C	600mm +	Brown	-	Slightly moist		Poorly sorted silty fine sand	Fine to coarse, sub angular to angular gravel with clasts varying from 5mm through to 35mm

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	100 to 200mm	Dark brown	Organic rich	Slightly moist	Soft to firm	Slightly sandy, silty clay loam	topsoil
B	250 mm	Brown	-	Slightly moist	Soft to firm	Slightly clayey silty	Fine sand
C	550mm +	Brown	-	Slightly moist		Poorly sorted silty fine sand	With occasional fine to coarse, sub angular to angular gravel with clasts varying from 5mm through to 40mm

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	100 to 150mm	Dark brown	Organic rich	Slightly moist	Soft to firm	Slightly sandy, silty clay loam	topsoil
B	300mm	Brown	-	Slightly moist	Soft to firm	Slightly clayey silty	Very fine sand
C	450 mm +	Brown	-	Slightly moist		Poorly sorted silty very fine to fine sand	With fine to coarse, sub angular to angular gravel with clasts varying from 5mm through to 25mm

APPENDIX 3

Wastewater Design Sheet

SUSTAINABLE ENVIRONMENTAL ENGINEERING LTD

Wastewater design sheet

Client	Mr Williams
Location	Ngakuta Bay
Designer	MTD
Date	October 2012

Households with Standard fixtures and 11/5.5 dual flush toilet	
Appliance/Fixture per Person Daily allowance	
Design wastewater flow per person per day (l/p/d)	**200**
11/5.5 dual flush toilet	**Minus 20l/p/d**
Adjusted Design wastewater flow per person per day (l/p/d)	**180**
No of Bedrooms	**4**
Equivalent Occupancy	**8**
Design Daily Wastewater Allowance (l/d)	**1440**

Secondary Treatment	Yes	
Soil Category	1/2	
Design Loading Rate	50	mm/day
Design Daily Allowance l/day	1440	l/day
Bed requirement (min)	29	m^2 (min)
Bed Length	7.25	m
Bed Width	4	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"

APPENDIX 4

Biolytix System

BIOLYTIX TECHNOLOGIES *Technical Note No 3*

BIOLYTIX FILTER STP

Introduction

This technical note provides a summary of the Biolytix Sewerage Treatment Plant.

Wastewater Treatment Details

General

Wastewater and food waste is treated in Biolytix Filters using Biolytix Filtration (see Figure 1), a patented passive aerobic process. The technology is based on layered, flexible modular filter elements that are designed to also be installed into a conventional septic tank unit but are equally suitable to be used within any vertical cylindrical tank (normally a minimum depth of approximately 1.5m is required).

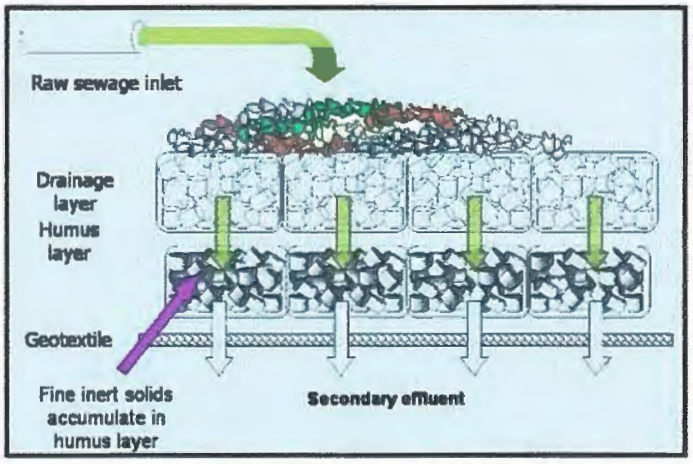

Figure 1 Biolytix Filtration Schematic

The Biolytix™ Filter unlocks nature's magic to odourlessly treat sewage, wastewater, food wastes and even scrap paper & cardboard. The filter is a robust organic soil ecosystem which is not only fed by the organic wastes that are filtered out of the wastewater but is actually structured from the fine humus produced, cleverly turning the problem into the solution. Just as humus is the key to soil fertility, it is also the key to the Biolytix™ Filters cleansing powers. Billions of microscopic organisms inhabit every gram and millions of worms beetles & other organisms structure it so that its drainage and air porosity are continually renewed and maintained indefinitely. It is normally a single pass filter where wastewater enters at the top of the bed and clear organically filtered water, is pumped out from the bottom.

STP Filter Configuration

There are two main versions of the Biolytix Filter available to treat domestic wastewater, a BF6 filter that treats domestic wastewater to produce a high secondary treated effluent and a BF2 filter that produces effluent similar to a septic tank.

A schematic of a single Biolytix Filter, BF6 is shown in Figure 2. Normally the filter is constructed within a standard 2,500 litre polymer tank (1.88m dia by 1.63m high). The only mechanical components in the standard treatment unit (BF6 filter) are a single phase industrial strength pump and a tiny (5 watt) air pump.

The BF2 filter is very effective at removing COD and may be used as a pretreatment module in a Biolytix Sewage Treatment Plant (Biolytix STP). When operating as a pretreatment module, an air pump is added to the standard BF2 filter to provide supplementary aeration. The modified BF2 filter is marketed as a Biogrinder Pumping Station (BGPS). In the Biolytix Filter STP option, wastewater is initially pretreated in a BGPS unit before discharging to a number of BF6 units operating in parrallel.

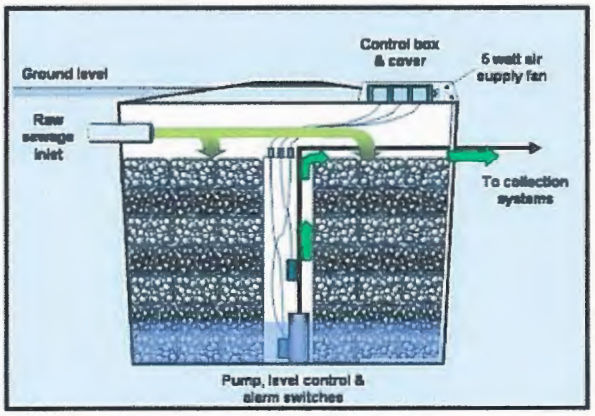

Figure 2 Typical Biolytix Filter – BF6 Cross Section

A typical cross section of a Biolytix Filter Sewerage Treatment Plant, BSTP-10kL is contained in Figure 3. The BSTP-10kL filter configuration is capable of treating a daily wastewater flow of 10,000 litres per day. The BSTP-10kL consists of 4 standard filters each, 1.88m diameter and 1.63m high and therefore requires an installation area of approximately 16m^2. Due to the modular nature of the treatment units the BF2 and BF6 filters may be installed at different site locations and in any shape configuration (e.g. straight line, triangular shape etc).

There are also BSTP-3.3kL and BSTP-6.6kL options. The BSTP-6.6kL option has one less BF6 filter and the BSTP-3.3kL two less BF6 filters than the BSTP-10kL. Figure 4 provides a plan detail of a BSTP-6.6kL treatment plant arrangement.

The BSTP-10kL treatment system is modular and multiple treatment units may be installed to provide a treatment solution for schemes with flows greater than 10kL/day. In this instance the flows to each of the BF2 pretreatment filters would need to be configured so that flows do not exceed 10kL/day. This would need to be achieved by appropriate configuration of gravity sewers or alternatively a macerated pump flow would be required to distribute flows evenly to the BF2 pretreatment filters.

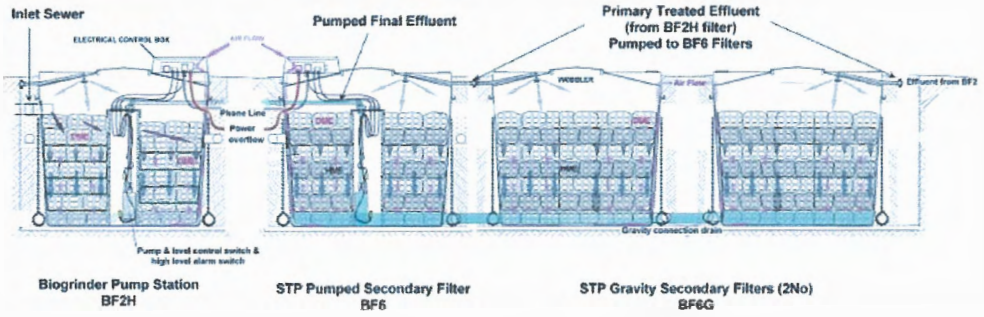

Figure 3 Biolytix BSTP-10kL Cross Section

Operation

Wastewater normally gravitates to the STP, BF2 pretreatment filter. A standard BSTP treatment system is supplied with an inlet at 0.4m to pipe invert, however options are also available for 0.65 and 1.0m invert depths. The pretreated flow from the BF2 filter is pumped in parallel to up to 3 BF6 secondary treatment modules, subject to the treatment plant rating (i.e. 3.3, 6.6 or 10kL/day). The BF6 secondary treatment modules are linked at their bases to enable effluent to be pumped from the treatment facility from a single pump well.

The filter is normally supplied with a phone line telemetry alarm system or if necessary an audio visual site alarm system.

The STP units are able to cope with power outages and unlikely pump failure events. In these situations the BF2 filter is normally designed so that effluent may overflow to the BF6 filters but only after passing through the filter bed layers of the BF2 unit. Without pretreatment in the BF2 filters the BF6 filters still have capacity to treat 1,600L/day each or in excess of 2,200L/day (4 day peak) to a high secondary standard. If there is total failure of BF6 pumping system, there is in excess of 1,300 litres of storage within each BF6 bed prior to effluent overflowing to an emergency subsurface drain. Any overflow would be treated effluent or at least partially treated effluent during an extended failure event (e.g. power failure) as similar to the BF2 filter overflow, all effluent is required to pass through the BF6 bed prior to overflow.

The Biolytix Filter is a low energy treatment plant. Operational efficiency of a Biolytix STP varies subject to the discharge head of the final effluent pump and the average daily flow discharged to the filter. Typical energy usage of a BSTP may vary in the range of 0.3-1.5 kWhr/kL treated, including allowance for pumping of the treated effluent, or if discharge pumping is excluded, 0.15 to 0.6 kWhr/kL treated. Maximum efficiency occurs when the filter is loaded at its rated capacity.

Performance

SIA Global completed independent performance tests of the Biolytix Filters to Australian Standard, AS1546.3 On-site Domestic Wastewater Treatment Units Part 3: Aerated Wastewater Treatment Systems September 2003. Table 1 summarises the results from the independent testing on the BF6 filter. Essentially the independent testing showed that the Biolytix Filter (BF6) produces a high quality secondary effluent (at average flow rates they consistently produce a 5/5 BOD_5/ TSS effluent). The Biolytix filter normally achieves 3-4 log reduction in Thermotolerant Coliforms.

Table 1: Effluent Characteristics Biolytix BF6 Filter

Characteristic	Results	Maximum	Average
BOD_5	100%<20 mg/L 90%<11.6 mg/L	14 mg/L	8.8 mg/L
Suspended solids	All < 30 mg/L 90%<8.9 mg/L	14 mg/L	5.4 mg/L
Dissolved Oxygen	100%>2.0 mg/L	Minimum 2.2 mg/L	4.26 mg/L

BIOLYTIX TECHNOLOGIES *Technical Note No 3*

The Biolytix Filter, BF6 has been accredited in all Australian states (interim accreditation in Tasmania). To obtain accreditation the Biolytix Filter was independently tested to AS1546 and was proven to treat domestic wastewater up to 1,600 litres per day with 4 day peaks of 2,150 litres per day.

Legislation varies in each state regarding the approval requirements for the Biolytix Filter STP system and Biolytix Technologies should be contacted to confirm specific requirements and current status of BSTP approval applications.

Further information on the Biowater concept and Biolytix Filters can be viewed at www.biolytix.com.

Maintenance

Maintenance requirements for the BF6 filters are basic and normally limited to an annual maintenance inspection of the pump and top layer of the filter bed and check on pump and air blower.

The BGPS prefilter unit (in the BF-STP) would initially require monthly inspections over the first 12 months. Subject to the nature of the wastewater loading and results of the first annual review it is likely that inspections would be required every 3 to 6 months in following years.

Any accumulated non biodegradable material within the filter units would need to be removed manually and disposed to land fill in accordance with local regulations.

Humus build up requires sections of the top layer of the filter bed (BF6 filters) to be replaced in accordance with loading rates. Under normal operation humus (uncompacted) is created at a rate of 10L/person/annum (at full domestic loading rates) and would need to be disposed to an appropriate landfill site or preferably to re-inoculate new filter units.

The Biolytix Filters are very robust and capable of accepting variable loads normally, including possible periods of no flow. The filters are normally maintained by a plumber or semi-skilled personnel.

Biolytix offer a fully comprehensive maintenance contract that covers all maintenance, requirements, emergency callouts and replacement parts. The contract is typically offered for a 20 year period. Pricing varies with location due to the affect of travel costs.

Proven Technology

Biolytix™ has invested more that $3 million to refine its patented treatment process and engineer it to fit into a neat compact package. Many prestigious and discerning clients in New Zealand, Australia and South Africa already enjoy the benefits of the Biolytix™ Filtration for households and on a larger scale for Golf Course Estates, Eco-Resorts and Five Star Hotels.

In Australia Biolytix Technologies has concentrated mainly on small scale treatment systems that are modular and may be easily grouped or networked to treat relatively high wastewater flows. There is a Biowater scheme operating on Macleay Island, Queensland (Australia) that was completed in partnership with the water authority, Redland Water and Waste. As a group Biolytix has done some large projects. The Spier complex (South

Africa) treats over 240kl/day in two cluster plants with some smaller plants spread as appropriate to minimise the cost of collection.

A strength of the Biolytix technology is that it can be scaled to give the best economic outcome. One size does not fit all in practice and the Biolytix modular approach is designed to overcome this problem and allow scale up and even scale down if required by the usage on the site.

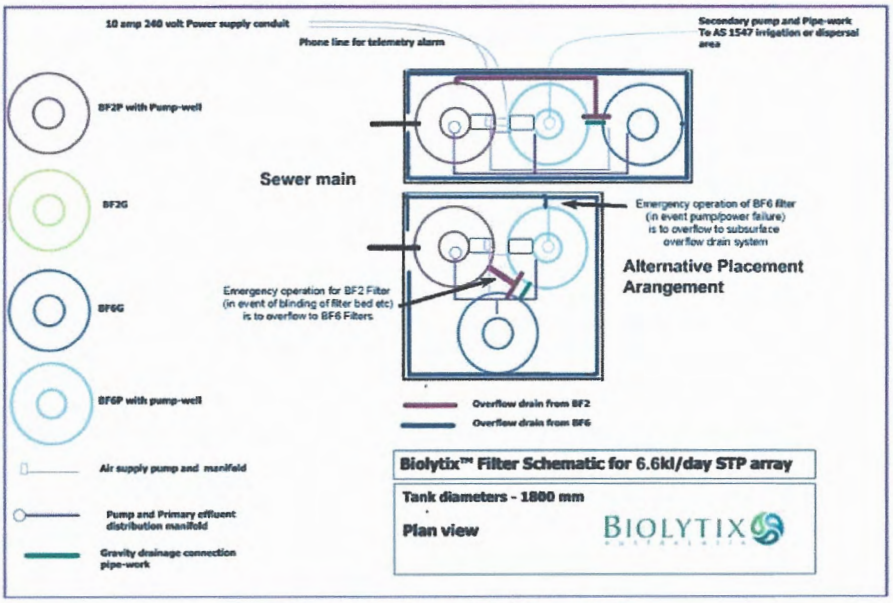

Figure 4 Biolytix Filter BSTP-6.6kL Plan Details

APPENDIX 4
Site Photographs

Existing Buildings – Old building at rear to be removed.

View towards Garage and Road

Culvert under Queen Charlotte Drive

Stream mid-section