SUBMISSION FOR AUCKLAND WATER REVIEW

Appendices

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Te Taiao o Waitakere

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Refer: Peter Reid : (EcoWater Business Unit) Ref: JB
(Extension No. 8223) (133 Central Park Road)

26 November 1999

Watercare Services Ltd
Private Bag 92802
Penrose
AUCKLAND

Attention: Kevin Stevens

Dear Kevin

WAITAKERE ECO-NEIGHBOURHOOD CO-HOUSING PROJECT RANUI

Council has been approached by a developer Waitakere Eco-Neighbourhood Co-Housing to carry out a development at 449-457 Swanson Road, being Lots 1 and 2 DP45216. The site comprises of 1.67ha of residential land.

The developer wishes to use an onsite wastewater disposal system, rather than connect to the reticulated system. EcoWater is happy with this, provided the developer obtains the appropriate consents from the Auckland Regional Council and the Health Department.

The developer has requested that Council ask if Watercare are agreeable with this development proceeding and using an on site wastewater disposal system. The developer also requests that if the proposal goes ahead that the land be excluded from the inner drainage area.

Please could you advise Watercare's position on the above as soon as possible.

Yours faithfully

P Reid

Peter Reid
Drainage Assets Engineer
EcoWater Business Unit

Watercare Services Limited
Wastewater
273a Church Street
Onehunga
Private Bag 92802
Penrose
Auckland

Telephone 0-9-634 7640
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New Zealand

6 December 1999

The Manager
Waitakere City Council
Private Bag 93 109
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WAITAKERE CITY

Attention : Mr Peter Reid

Dear Peter

WAITEKERE ECO-NEIGHBOURHOOD CO-HOUSING PROJECT RANUI

Thank you for your letter dated 26 November 1999 requesting Watercare's position on excluding land from within the Inner Drainage Area, if an on-site wastewater disposal system was in place to service this land.

The wastewater infrastructure is already in place to service this land. The area being considered is relatively small and any reduction in flows into Watercare's system would be insignificant and therefore would not be reflected in any cost savings.

Hence Watercare could not agree to an exemption to this land from the Inner Drainage Area and subsequent servicing charges.

Yours faithfully

K Stevens

Kevin Stevens
Collection System Planner
Wastewater Planning

Chief Executive	
Corporate Services	
Community Devel	
Regulation	
Strategy & Dev	
Human Resources	
City Infrastructure	
Major Issues	
Eco Wak	✓

1.0 Wastewater

1.1 Definition

Domestic wastewater is a term to describe waterborne wastes originating from household activities including toilets, kitchens, bathrooms and laundries.

Traditionally disposal is achieved by public sewers in reticulated areas or alternatively with an on-site system that provides treatment and disposal of waste residuals within the property boundaries of their place of origin. On-site disposal is achieved via subsurface soakage and assimilation to soil, assisted where appropriate by evapotranspiration from vegetation.

Domestic wastewater can be segregated into two separate flows, being:

- Blackwater - comprising toilets and bidet and having gross faecal contamination.
- Greywater (sullage) - comprising all remaining household wastewater eg bath, laundry.

1.2 On-site vs Off-site Treatment and Disposal

It has been argued that historically the sanitary sewer can be partly credited with achieving a relatively healthy population and the low incidence of water borne disease by effectively isolating the community from wastewater.

More recently the conventional practice of centralised wastewater systems has been questioned not only in the context of public health but also from a economic, environmental, social and cultural perspective.

Discharging treated wastewater effluent via point discharges to the natural water environment is having to meet increasingly high discharge quality standards in order to achieve community expectations for environmental management.

The well publised beach closures as a result of sewer overflows are becoming increasingly unacceptable in modern society. The financial cost of upgrades to pipe networks and treatment plants demanded by society is substantial.

Traditionally on-site wastewater treatment and disposal systems have been characterised by simple (non scientific, experienced based) septic tank and soakage trench systems. A high failure rate of these system in New Zealand led to the encouragement of centralised schemes and the discouragement of unsewered development.

Overseas considerable research and development of on-site technologies coupled with new approaches to the management of these systems were used to overcome these problems.

More recently there has been a growth of decentralised or community/cluster based schemes where wastewater is treated as close to where it is generated as practical. The scale of these schemes permits the use of proven new technologies where wastewater can be reused as a resource, not a waste. Operational and management schemes can be put in place to protect users and maintain public health.

This alternative strategy has many potential benefits particularly in smaller communities and the urban fringe.

The community based concept offers several environmental, economic and social benefits relative to conventional practice. These include:

- Smaller flows, implying smaller consequence from any mishap.
- Less potential for overflow, infiltration, exfiltration with 'sealed' pipework reticulation reducing environmental risks and allowing downsizing of components.
- Less environmental disturbance from system construction and lower installation costs with smaller, shallower pipework and less network infrastructure.
- Treatment and reuse tailored to waste stream ie industrial waste need not be combined with domestic wastes.
- Reuse of effluent becomes more cost efficient. Reuse can reduce potable water demands.
- Costs assigned directly to the activity generating new demands (ie fairer basis).
- Expansion would track demand more closely rather than building and funding capacity for the future.
- In urban areas on-site disposal reduces the overloads to the conventional wastewater collection and treatment systems.

2.0 Cost Benefit Analysis

2.1 Base Data

a) Introduction

The purpose of this study is to carry out cost benefit analysis of the following on-site wastewater treatment and disposal technologies addressing quality, quantity and reuse issues. The analysis was undertaken using an example site (provided by WCC). The technologies (options) analysed were:

i) Off-site - Wastewater directed to public reticulation. This option has been analysed to allow a comparison to the alternative on-site options.

ii) On-site Treatment and Disposal - communal on-site biological treatment and land disposal ('restricted' use).

iii) Use of Water Reduction Features with:

- Off-site system
- On-site system

iv) Water Reuse - On-site systems utilising water reuse for:

- Toilet flushing
- 'Unrestricted' use

v) Greywater Reuse - On-site systems utilising water reuse for:

- Toilet flushing
- 'Unrestricted' use

Blackwater is directed to the sewer.

The study developed conceptual layouts and preliminary cost and benefit estimates sufficient for a comparative cost/benefit analysis.

b) Site Data

The subject site provided by Waitakere City Council for the purposes of the study.

- Location - urban fringe
- Public reticulation of water supply and wastewater available.

- Rectangular site measuring 200 x 80m with gentle ground slopes falling to central drainage axis.
- 'Typical' Auckland subsurface conditions - low permeability silts or clays. No groundwater constraints (iē low GWL's).
- Proposed development - co-housing type development consisting of 26 residential units laid out in groups of 3-4 units.

c) Study Criteria

Criteria for conceptual designs and benefit/cost analysis, as agreed with WCC, were as follows:

- Water reuse benefit and the benefit in the reduction in potable water demand are equivalent to $1.41/m³. This rate will increase at 2% per annum for the next 5 years and then remain constant (as advised by Ecowater for the Water Supply Strategy Study).
- The benefit in the disposal of wastewater on-site is equivalent to $405 per household per annum. This rate will increase at an average of 7% for the next 6 years and them remain constant (as advised by Ecowater from the Long Term Financial Strategy Study).
- Projected life is 50 years.
- Discount rate is 7% per annum.
- Preliminary cost estimates include the following allowances:

Uncosted items	10%
Preliminary and general items	10%
Engineering	10%
Contingencies	15%

These allowances are slightly lower than utilised for the stormwater analyses. On-site wastewater requirements and cost estimates can be relatively accurately defined.

- The analysis does not take into account inflation. The underlying assumption is that the difference in operating costs and benefits would remain roughly the same.
- The analysis do not take into account the benefits to the wider community of on-site treatment and disposal as outlined in section 1.2 ie environmental benefits etc.

Design Wastewater Volume

Fixtures	Wastewater Allowance l/p/d	Wastewater Volume (m³/d)			
		Total (site)	Blackwater	Greywater	Total/Unit
Standard	180	16	3.4	12.6	0.615
Full water* Reduction fixtures	90	8	2	6	0.31

* refer Option 3)

Actual (off-site) and design (on-site) wastewater production figures can be compared as follows:

	Av-household Wastewater Production l/d	Occupancy per household No.	Wastewater Production l/p/d
Off-site (WCC actual data)	415	2.9	143
On-site (Design requirements)	615	3.4	180

For this cost/benefit analysis both sets of figures have been applied where appropriate. Although the on-site design figures are conservative, Regulatory Authorities will require the system design to adhere to the design criteria. In considering the water reduction fixtures (option 3) the following figures have been used:

	Wastewater Production l/p/d		
	Standard Fixtures	Full Water Reduction Fixtures	Saving
Off-site	143	90	53 (37%)
On-site (Design Requirements)	180	90	90 (50%)

2.2 Results of Cost Benefit Analysis

The results of the Cost Benefit Analysis are summarised in the Table given in the following page.

Option 3(ii): On-site disposal with water reduction fixtures is the recommended option for the Wastewater Management of the Example Site.

Wastewater Flow Allowances and Savings with Water Reduction Fixtures (On-site Wastewater Design)

Household Water Use	Appliance/Fixture per Capita daily Flow Allowance for Dwellings on Community Water Supply (l/p/d)				Total Per Capita Flow for On-Site Design (l/p/d)	Total Per Capita % Reduction from Standard Household Fixtures
	Toilet	Washing Machine	Shower and Bath	Washbasins (Kitchen, Bathroom, Laundry)		
1. Standard Household Fixtures (standard dual flush toilet, top loading washing machine)	38	22	90	30	180 [140]	-
2. Standard Household Fixtures plus flow control valves	38	22	80 (33%)		140 [115]	22%
3. Full Water Reduction Fixtures (low flush dual flush toilet, front load washing machine, low flow shower head, aerator faucets)	22 (42%)	13 (41%)	50 (44%)	15 (50%)	100 [85]	44%
4. Full Water Reduction Fixtures plus flow control valves	22 (42%)	13 (41%)	55 (54%)		90 [80]	50%

Notes

1. The figures in round brackets, eg (42%), represent % reduction of individual household fixtures over standard fixtures.
2. The figures in square brackets, eg [140], represent design flow allowances for rainwater tank supply.
3. l/p/d = litres/person/day

SUMMARY TABLE

COST BENEFIT ANALYSIS OF NEW TECHNOLOGIES - WASTEWATER

OPTION	PRELIMINARY COST		PRELIMINARY BENEFITS		NET PRESENT COST (NPC)	COMMENTS
	CAPITAL	O & M	WATER	W.WATER		
Option 1: Conventional Offsite Reticulation	$45,000	$0 p.a.	n.a.	n.a.	$42,056	Low capital and O&M costs. No additional benefits other than meeting mandatory requirements.
Option 2 : Onsite Treatment and Disposal	$165,300	$9,000 p.a.	$1,260 p.a.	$10,530 p.a.	$58,022	Competitive with conventional system above. Many potential benefits to wider community which cannot be quantified.
Option 3 : Water Reducing Fixtures Option 3(I) : Offsite Reticulation **Option 3(ii) : Onsite Disposal (Preferred Option)**	$63,800 **$176,900**	$0 p.a. **$9,000 p.a.**	$2,420 p.a. **$5,360 p.a.**	n.a. **$10,530 p.a.**	$23,407 **$7,498**	Significant potential to reduce wastewater volume and potable water requirements.
Option 4 : Water Reuse (Onsite systems) Option 4(I) : Toilet Flushing Option 4(ii) : Unrestricted Use	 $189,660 $196,910	 $10,000p.a $11,000p.a	 $6,390 p.a. $6,523 p.a.	 $10,530 p.a. $10,530 p.a.	 $17,811 $36,395	Attractive option further minimising potable water demand. Unrestricted suboption has additional potential benefits which cannot be quantified.
Option 5 : Greywater Reuse Option 5(i) : Garden Irrigation Option 5(ii) : Toilet Flushing Option 5(iii) : Unrestricted Use	 $135,575 $150,510 $157,760	 $7,000 p.a. $8,000 p.a. $9,000 p.a.	 $5,360 p.a. $6,390 p.a. $6,523 p.a.	 n.a. n.a. n.a.	 $143,090 $155,435 $174,020	Significantly more expensive than other reuse options due to dual systems. Where potential for human contact, greywater must be treated to same standards as blackwater.