

On-site wastewater servicing options Planning, options and selecting a system

Prepared by Andrew Dakers
ecoEng Ltd
www.ecoeng.co.nz

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1 Introduction

In areas not serviced by a community wastewater service it is necessary for a household to have its own “approved” on-site wastewater service. “Approved” means a system that meets regional and district council bylaws and rules.

Note: Further details on planning and costing an on-site wastewater system are covered in the ecoEng Information Sheet OSWS.060203, *Planning, selecting and costing an on-site wastewater service for your home.*

2 Planning your system

First thing to do.	Go and talk to the local district council. They may refer you to the requirements of the Regional Council.	<p>Ask:</p> <ul style="list-style-type: none"> • What information do they have about on-site wastewater systems? • What rules apply? • Is a permit or resource consent required and what are the likely costs? • Do I need a technical design report and producer statement?
Deciding what type of system to install.	The key issue is to obtain a suitable system that is affordable and will be permitted by the local regional and the district/city council. Site circumstances will influence best system.	<p>Sources of information</p> <ul style="list-style-type: none"> • There are qualified consultants who can advise on which would be the best system. • Talk to professional drainlayers and installers. • You can talk to suppliers of particular technologies. • Ask the Council for their advice. • Ask locals who have recently installed a system • Refer to Section 3 of the Information Sheet for more details.
Resource consent requirements.	All wastewater systems are subject to the requirements of the RMA and the Building Act. The regional council sets out the RMA requirements in their Regional Plan. The District Council implements both the RMA and the Building Act.	A qualified and experienced person can advise on the requirements in terms of the RMA. Or you may choose to do this yourself. Some suppliers and/or installers of particular commercial systems will provide this service. This should involve a site and soil assessment. If the proposal meets all the rules of the regional plan then it is very likely it will be granted permitted activity status and a resource consent would not be required. The local regional council is responsible for granting this status. The District Council will specify their requirements which may be the same or different to the requirements specified by the Regional Council.

<p>Do you need a technical design report and producer statement?</p>	<p>There is a significant cost (maybe up to \$1000+) to obtain a technical or engineer's report and producer statement, so the key question is; is it necessary?</p> <p>Firstly ask your city/district council if they require this with the building consent application. Some councils do. They may require that a "qualified person" to provide a "design producer statement" and "completion certificate". If this is required then clearly you will need to engage a "qualified person". The council should be able to advise on people who are qualified to provide this service.</p> <p>With respect to the regional council's requirements, they are responsible for issuing discharge consents under the RMA. You will need to determine whether or not your proposed on-site system will be a permitted activity or discretionary activity. If the former you will not require a resource consent and will be issued a general authorisation to discharge. If the latter, you will be required to apply for a resource consent. In the case of applying for a permitted activity you will probably need to provide the regional council with a site plan and design details and specifications of the proposed system. You may be able to do this yourself. In the case of applying for a resource consent, you not only have to provide a site plan and design details and specifications but also an assessment of environmental effects (AEE). You are advised to engage a qualified person to investigate the site, provide a design and an AEE.</p> <p>Note: It is very unlikely that you would get a qualified person issuing design and completion producer statement for systems where they have not done the site investigation and system design and specification.</p>
<p>Obtaining a site assessment</p>	<p>There are a number of qualified people who are able to do a site assessment. This involves visiting the site, examining the soils, obtaining dimensions and slopes of the property, location of boundaries, groundwater, water courses, and any wetlands etc; gathering information about the proposed house. A technical report will then be prepared. The consultant may be required to provide producer statements and certification of the installed system. Many councils now require these as producer statements.</p>
<p>Possible items of cost.</p> <p>There are a number of costs involved and these should be planned for</p>	<p>Costs may include some or all of the following items :</p> <ul style="list-style-type: none"> • A site assessment and engineering report by a qualified person. • If a resource consent is required; <ul style="list-style-type: none"> ○ there may be the cost of engaging a consultant to apply for a resource consent, ○ there will be the cost of the Regional Council to process and audit the consent application. • The installed costs of the wastewater system. • A condition of the consent may be to submit to Council; <ul style="list-style-type: none"> ○ a management plan, ○ professional certification of the installed system. <p>There will be costs associated with these requirements.</p> • There are likely to be annual operating, servicing and maintenance costs. You can agree to an servicing contract whereby the servicing agent agree to do the servicing of your system for a set annual fee. You should check what the servicing fee includes and excludes. <p>For more specific costing you should request this information from the parties involved.</p>
<p>How long will it be before my system is installed ?</p>	<p>This varies. The various parties that may be involved include the wastewater engineering consultant, council consenting staff, technology supplier and the installer. The time taken will depend on:</p> <ul style="list-style-type: none"> • How busy the various parties are at the time. • Whether a resource consent is required (if it is a permitted activity no resource consent is required and this will save time and money) • Availability of required technologies. <p>It can take several weeks or even months so it is a good idea to begin the process as soon as possible.</p>

3 Choosing the most appropriate on-site system

An on-site wastewater service consists of two main components. These are:

- The treatment and dosing unit;
- The system for returning the treated wastewater to the local ecosystem – sometimes referred to the dispersal system or land application system.

There are a number of different treatment units and dispersal systems that may be considered for a site. In choosing the most appropriate system considerations should be given to the level of service required by the property owner and or occupier, site conditions, the performance requirements and the capital and running costs. These are explained as follows.

3.1 Level of service required

The property owner has to decide what level of service is required. This may range from a minimal management waste disposal system that is trouble free, convenient, requires minimal or no input from the occupier and enables a highly reliable flush-an-forget service. At the other end of the service scale would a system that recognizes waste as a resource and incorporates technologies and operational rules that minimizes water use, recycle wastewater, recovers organics (composting) and nutrients and requires some operational effort from the occupier. What ever level of service is desired by the occupier and/or owner, the system will have to meet public health and environmental standards as required by relevant legislation.

3.2 Site conditions

The important site conditions that will influence the type of system that is most appropriate are:

- The quantity of wastewater to be managed e.g. for a 4 bedroom luxury home this may be as high as 1400 L/day whereas a 2 bedroom house with water saving the wastewater volume maybe as low as 500 L/day;
- The area of land available within the property boundaries
- Setback distances from:
 - boundaries;
 - private water supply bores and wells;
 - public (community) water supplies;
 - surface waters (streams, lakes, wetlands).
- The type of soils in the land application field;
- Ground slope and drainage;
- The level of the highest groundwater table;
- Risk of flooding
- Proximity to special zones and ecologically sensitive areas.

3.3 Performance requirements

The required performance of an on-site wastewater service is usually determined by the regulatory authorities, and in particular the Regional Council (who implement the Resource Management Act with respect to protection of natural resources) and District Council (for parts of the Resource Management Act, the Building Act and the Health Act requirements).

The main compliance framework is the Resource Management Act, normally specified in the Regional Rules (in the Regional Plan) set out by the local Regional Council. The objectives of such performance criteria are:

- to protect public health
- to achieve less than minor environmental effects over the duration of the granted consent.

The Regional Council may set rules and/or conditions that will relate to such matters as:

- Separation distances of dispersal area from surface water bodies (streams, lakes, wetlands) and groundwater tables;
- Separation distances from boundaries, water supply bores and wells, community water supply facilities;
- Designated zones, culturally and ecologically sensitive;
- Slope and stability of ground;
- Hydraulic loading rate to dispersal area;
- Servicing, management and monitoring requirements

3.4 Costs

While actual costs are not given, this Information Sheet identifies and explains the cost components, which are not only the cost of the technologies and installation, but also the costs of site investigation, consenting and certification.

In terms of the installed cost of the technology and hardware, this can vary considerably; most within the range of \$7000 to \$25000 per household, depending on the factors discussed above.

4 Types of on-site wastewater systems

The main types of systems are listed, briefly described and evaluated in the following Table.

Table 1. Some wastewater service options

Option	System Type	Brief Description	Attributes and Assessment
1	Septic tank with a filter and discharge to a soak hole	All wastewater drains to an in-ground septic tank fitted with a proprietary filter. The outflow overflows to a soak hole.	Cheapest option. There must be ground conditions that allow soakage. Many regional rules will not support this option, or will do so only in designated zones, because of the higher risk of groundwater contamination.
2	Septic tank with a filter with trickle or dose loading to seepage trench/bed or treatment trench/bed.	All wastewater drains to an in-ground septic tank fitted with a proprietary filter. The outflow from the tank is either dose loaded (by pump or siphon) or gravity feed to trenches or beds.	Used on sites with adequate land area and slope and with low water table. Subsoil conditions are to be sufficiently well draining to avoid trench or bed flooding. In very free draining sandy and/or gravel soils overlaying an important groundwater resource, the more expensive treatment trench may be required. There are different ways of loading to the trench. For small volumes, gravity or trickle loading may be acceptable but the preferred method is dose loading using a siphon (if there is at least 1 m fall from the septic tank outlet and the top of the trench/bed) or a pump.
3	Septic tank to a dispersal mound (pump dosed)	A mound is constructed on the site (maybe 30 to 90 m ² depending on soil type and wastewater volume). The mound may be over 1m above ground level and is constructed with a specific grade of sand and covered with a topsoil layer. Sphagnum peat mounds may also be an option.	Normally used for sites with seasonally high water table. There needs to be a dedicated area of land for the mound and it could become a dominant landscape feature.
4	Advanced treatment to subsurface irrigation	<p>There is a range of different types of advanced treatment units and subsurface irrigation technologies available. The three main treatment processes employed by such treatment units include:</p> <ul style="list-style-type: none"> • Fixed growth aerated wastewater treatment systems (FG-AWTS) – these include recirculating sand and fabric filters (packed bed reactors). These units are sometimes referred to as biofilters and use moist non-submerged ecologies; • Humus biological filter units (wet composting, vermiculture) that use a moist humus to provide an ecology of a diverse range macro and micro organisms for the biological stabilization process. 	Generally these systems are a more expensive option – although not always. These systems tend to offer the lowest environmental impact therefore possibly more consentable. They do provide the opportunity to recycle water and wastewater nutrients back to the topsoil for biomass production and/or landscape enhancement. Some systems enable water recycling for non-potable uses such as toilet flushing. In such applications, disinfection is normally required.

		<p>These systems use moist non-submerged ecologies;</p> <ul style="list-style-type: none"> • Membrane treatment filters and membrane bioreactors (MBR), submerged membrane bioreactors (SMB). These systems use submerged ecologies; • Activated sludge (suspended growth) aerated wastewater treatment systems (AS-AWTS). These systems use submerged ecologies. • Combination of suspended and fixed growth. These systems are normally submerged ecologies. • Other: tertiary, nutrient stripping, constructed wetlands..... <p>Some of the suppliers of these technologies are listed in Table 2 below. The area of subsurface irrigation required may be between 250 m² to 500 m² depending volume and quality of the wastewater and soil and drainage conditions .</p>	
5	Other systems	<p>There are a number of other (less common) systems involving , for example, source separation (ie separating greywater and blackwater), waterless composting toilets, peat mounds and subsurface wetlands. In some situations these options may be worth considering.</p>	

5 Treatment technologies

There are an increasing number of manufacturers and suppliers of wastewater treatment technologies. The treatment technology is **just one component** of the on-site wastewater system which comprises:

1. **Source technologies and management.** This is what happens at the source (e.g. in the home) and the type of technologies used that generate the wastewater; such as type of toilet cistern and the flush volume, type of washing machine, shower head type and pressure and water use. Equally important is what people flush down the drain and toilet (See Section 6)
2. **Treatment unit:** as discussed there are many different options for treatment
3. **Dosing unit:** pump dosing or siphon. Getting the correct dose volume can be very important for the successful performance of the total system.
4. **Land application system;** the land application system is require to safely not

Sound and competent design, selection, installation and servicing of all **four** components are equally important to ensure reliable and a high standard of performance of the wastewater system.

The following table list some providers of treatment technologies. This list is not a complete. Listed providers are not endorsed by ecoEng Ltd.

Selection criteria for wastewater treatment unit.

When selected an on-site wastewater system there are a number issues you should consider. If you approach a particular provider of a system, apart from the cost of the system, ask what **services** they provide (see details in the following table). The following Table lists other issues you may wish to evaluate when selecting a particular onsite wastewater service or system, i.e: **site preparation, capital costs, annual costs, physical characteristics of the system, system performance, alarm system, nuisance factors and guarantee.**

Table 2. List of local (for Canterbury) onsite treatment system providers.

Provider	Model(s)	Treatment Process	Suggested contact
BioCycle (NZ) Limited	-Biocycle aerated wastewater treatment system.	Biological, aerobic suspended growth	Gordon Kenning 03 359 4443 Christchurch Email: info@biocycle.co.nz http://www.biocycle.co.nz
Biolytix Technology Ltd	Two models: ▪ BF2 biological filter ▪ BF6 2500 PAT	Humus ecology filter	Antony Willemse willemse@paradise.net.nz 03 942 8901 (Christchurch) www.biolytix.com
Hynds Environmental	- Septic tanks - Lifestyle system - Membrane bioreactor	- Septic tanks and filters Fixed and suspended growth system. - Membrane bioreactor	Mike Strickett Ph 03 344 1370 (Christchurch) mikes@hyndsenv.co.nz
Kiwitreat Ltd	KiwiTreat system	Activated sludge, suspended growth	Phone: 03 3125 787 Rangiora john@kiwitreat.co.nz http://www.kiwitreat.co.nz/
Oasis Clearwater	- Septic tanks - Submerged membrane. Texass; textile - Clearwater series 2000	- Septic tanks &filter - Membrane bioreactor - Fixed growth biological contact filter - Activated sludge, suspended growth	Lew Austin Ph 03 344 0262 (Christchurch) office@oasisclearwater.co.nz www.oasisclearwater.co.nz
RX Plastics Ltd	Air Tech 9000	- Septic tanks &filter - Biological, aerobic suspended growth	Neville Moon (Ashburton) 0800 661100
Smith and Loveless NZ Ltd	- MicroFast - RetroFast	Fixed and suspended growth, activated sludge.	Joe Gill 09 488 6701 (Auckland) joegill@xtra.co.nz www.biomicrobics.com
Innoflow Technology Ltd	- Septic tanks - Sand filters - Advan Tex - Pro tech	Septic tanks &filter Recirculating textile packed bed reactors Sand filters	PO Box 300-572 Albany Auckland info@innoflow.co.nz http://www.innoflow.co.nz/

Table 3. Information to seek to assist with system selection

Service	<p>Check details of services provided by the supplier of the wastewater system. These may be provided by one company or may involve several companies or individuals. The services may include:</p> <ul style="list-style-type: none"> • Soil and site assessment • Design report • Consent application (Regional Council and District Council consent applications) • Site preparation • Decommissioning (if an old system is being replaced) • Supply of equipment, freight and installation • Commissioning, providing as-built-plans and producer statement (if required) • Servicing and maintenance contract.
Site preparation	The requirements for site preparation will depend on the existing conditions of the site.
Treatment unit certification	<ul style="list-style-type: none"> • Details of certification by an independent certifier with signed evidence; • Reference to the engineering standards it conforms to – copies of design producer statements; • Declaration as to whether the treatment unit is a secondary treatment unit or advanced treatment unit.
Capital Costs	Planning and design costs: engineering fee, consenting costs, project management costs
	Total capital cost of technologies and hardware unit(s)
	Cost to install all the system components.
	Electrical and other wiring costs, alarms and telemetering as required
Annual costs	Power or typical energy consumption (kWh) per month
	Chemicals, if any.
	Servicing eg desludging, cleaning filters, checking dispersal system. Maintenance; which may require replacement of parts such as pumps, motors, filters, aerators.....
	Re-inoculation. For some systems, the treatment plant may have to be re-inoculated with biological organisms due to biological failure. Biological failure may be due to under-use (e.g. period of no wastewater input such as for a holiday homes) or toxic chemical input to the system such as anti-biotics, disinfectants, oils... In this regard some treatment systems are more resilient than others
	Monitoring costs – a condition of the resource consent may include monitoring. (This is not a common requirement)
	Note: A servicing contract with a qualified servicing agent is recommended and preferred by some councils. Some servicing contracts include the cost of all spare parts and replacement of equipment, while for others this is additional. Check out what the servicing contract does or does not include.
Physical characteristics	Dimensions of footprint during installation and of installed footprint
	Ease of installation – which may be site specific
	Has the system adequate anchorage to counter buoyancy uplift in conditions of high groundwater (if relevant)?

System performance	What is the quality of the effluent after treatment in terms of BOD ₅ and suspended solids. Nutrient levels (particularly total nitrogen) may also be relevant in some locations.
	System reliability and risk of failure.
	System resilience, i.e. system performance under variable loading – no load and shock loading e.g holiday homes.
	System resilience to occasional toxic compound inputs such as disinfectants, medication
Alarm and failure	<ul style="list-style-type: none"> • Description of alarm system used; • Action plan and impact of power failure; • Emergency storage capacity;
Nuisance factors	Odour, noise, insects, ponding, visual
Guarantee	Obtain full details of guarantees provided by the supplier
Referees	Contact details of at least 2 independent referees.

6 Taking care about what is flushed or drained into the wastewater treatment system

A failed or failing wastewater system is not only a health risk to occupants, and possibly neighbours, but also can cause nuisance odours, ponding and can be costly to fix.

Large doses of toxic substances in the wastewater stream will affect the ability of most wastewater treatment plants to breakdown and stabilize the wastewater constituents.

Care must be taken by occupants of the dwelling to ensure large quantities of toxic substances do not enter the drainage system. For examples certain products should not be flushed down toilets and sinks. Some laundry products can cause harm to the wastewater system.

Minimize discharging the following substances :

- Bleaches, whiteners, nappy soakers, stain removers, disinfectants;
- Antibiotics;
- Sanitary pads, tampons, disposable nappies, condoms and excessive quantities of paper;
- Excessive fats, cooking oils and greases;
- Antiseptics liquids.

Do not discharge to following into the wastewater system;

- Alkaline detergents such as caustic soda
- Acids, pesticides, herbicides, chemicals;
- Paints, varnishes and paint thinners
- Drugs and pharmaceuticals
- Motor oil
- Toys, clothing, plastic bags.....

Apply common sense – there are living organism in the system breaking down normal body waste products and heavy doses of toxic substances will kill these essential organisms and cause the system to fail.

Normally kitchen insinkerators can overload on-site wastewater treatment units with organic matter, however for those treatment units that use the vermiculture filter the worms and other macro organisms thrive on the macerated organic solids commonly produced from insinkerators.

Biodegradable household cleaners, laundry powders and liquids with low phosphorus and sodium content are recommended to enhance the life of the soils under the irrigation field.

Avoid excessive water volumes entering the septic system. This system has been designed for no more than 1500 L of daily wastewater. Volumes in excess of this are to be avoided except for short periods.

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