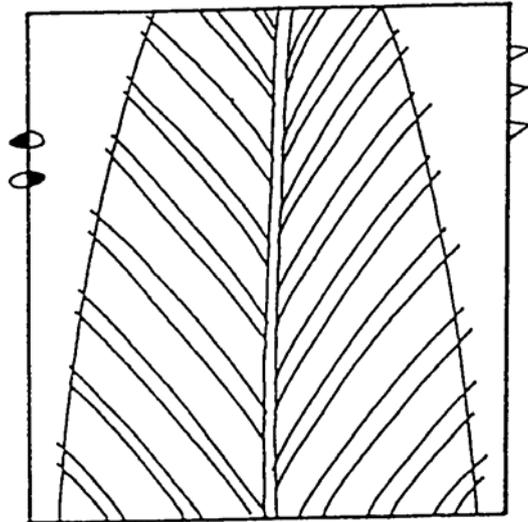


WASTE WATER



Waitakere City Council
Te Taiao o Waitakere

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This chapter is part of the Waitakere City Council's Sustainable Home Guidelines. The complete set can be obtained through most libraries or from the Waitakere City Council, Private Bag 93109, Henderson, Waitakere City 0650, New Zealand, phone (09) 839 0400, email: info@waitakere.govt.nz.

The guidelines are also available on the council's web site: <http://www.waitakere.govt.nz>.



What is wastewater?

Wastewater is the water we dispose of from our homes, offices and industry. It comes from toilets, sinks, showers, washing machines and industrial processes and is sometimes called sewage. Household wastewater can be divided into two sub-classes: greywater and blackwater. In rural areas wastewater is generally treated onsite via a wastewater treatment system and disposal field.

Blackwater is wastewater from toilets. It contains human waste and can be a public health risk if not handled properly.

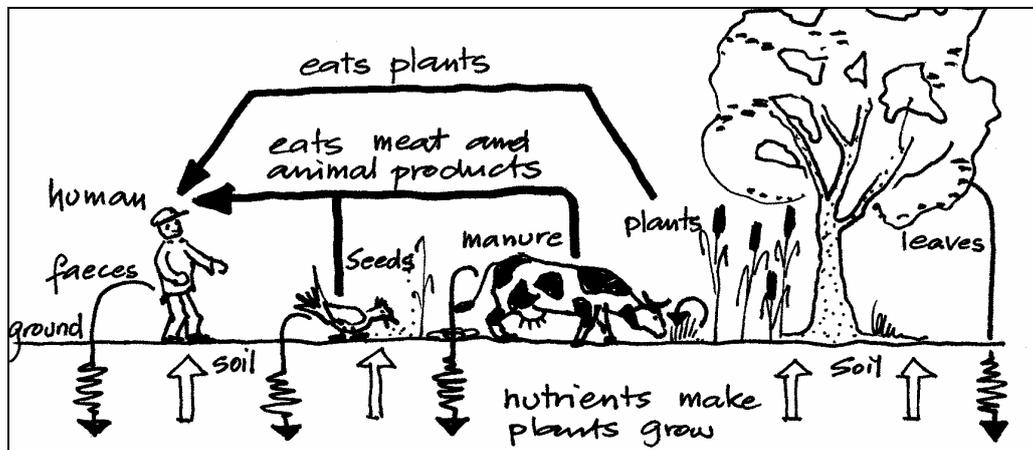
Greywater (sullage) is a lesser health risk, because it does not contain human waste. It is the wastewater from the kitchen and bathroom sinks, baths, showers and laundry.

Stormwater, or rainwater, is not wastewater, but some issues relating to it are included in this chapter. In Waitakere it is collected in separate drains. (Some older areas such as Central Auckland have combined sewers for storm and wastewater, which are progressively being separated.) The extra load from stormwater getting into wastewater drains causes major problems with treatment, so Waitakere puts considerable effort into keeping stormwater out of the wastewater network.



Wastewater issues

Waste or resource?



Simplified nutrient cycle

Human waste is a natural product that forms part of the nutrient cycle. It contains valuable nutrients, such as carbon and nitrogen, which aid plant growth. Traditionally human and animal wastes were allowed to break down naturally and the nutrients were given back to the earth. In many cultures human and animal wastes are still seen to be very valuable and are used as fertiliser.

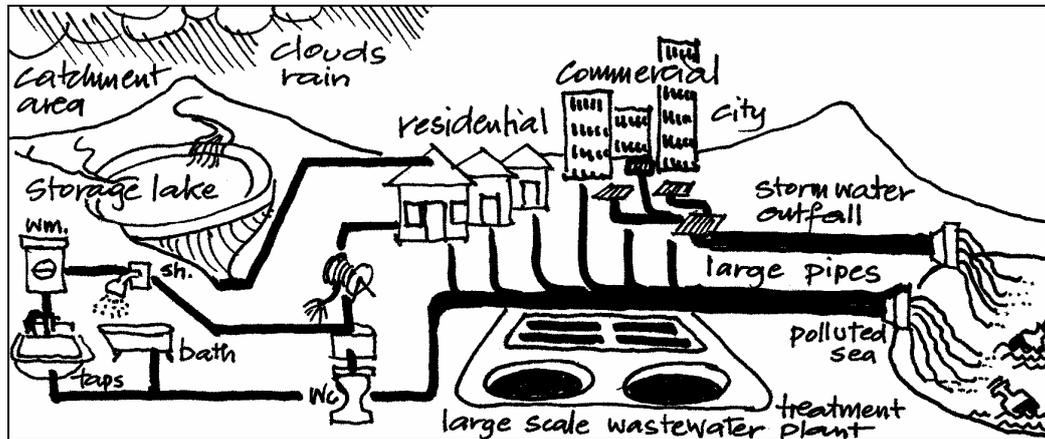
Flush toilets were introduced for increased convenience, especially in cities where population densities and waste volumes were high. Mixed with water, human waste forms a fertile breeding ground for micro-organisms and disease. To protect public health, extensive pipe systems were developed to take the wastewater away from human settlements – often out to sea or into rivers.

Over time it was realised that our wastewater was polluting waterways and the oceans. The high level of nutrients causes algal blooms and oxygen deficiencies in rivers, not to mention chemical pollution from industry. Rivers and some coastlines became contaminated to the point where the water was unhealthy to drink or even bathe in. To protect public health many cities introduced facilities to treat wastewater before it was discharged. Nevertheless these systems still cause pollution and result in the loss of nutrients to the sea. Most of the food we eat comes from the land and we need to ask whether we shouldn't give our waste back to the land to close the nutrient cycle.



Wastewater disposal in Waitakere

The wastewater from the urban area of Waitakere goes to Watercare Services Ltd's treatment plant at Mangere. If you live in the area served by this system you should connect to it.



Conventional wastewater system

The pipe system that takes the waste to Mangere is old and reaching its capacity, resulting in leaks and overflows into streams and harbours. Overflows are often caused by stormwater getting into the pipes through cracks, natural drainage into gully traps, and illegal connections like downpipes connected into the wastewater system. As the population increases, these problems become worse and the costs of upgrading and maintaining the system increase.

Residents outside the seweraged area have on-site disposal systems, such as septic tanks, high-tech wastewater systems, or composting toilets. The responsibility lies with the resident to make sure their system works and does not pollute the environment. These systems can work well and avoid the problem of concentrating all of the city's waste at one location such as Mangere. When they do fail the problems are generally (but not always) local.

Many old septic tank systems were poorly designed and sited, or the use they were designed for has changed over time. A bach has grown into a permanent home, for instance; modern appliances such as automatic washing machines have greatly increased the water discharged into the septic tank. Problems can arise when the disposal field (where the effluent soaks into the ground) is inadequately constructed for Waitakere's clay soils, which do not absorb water well.

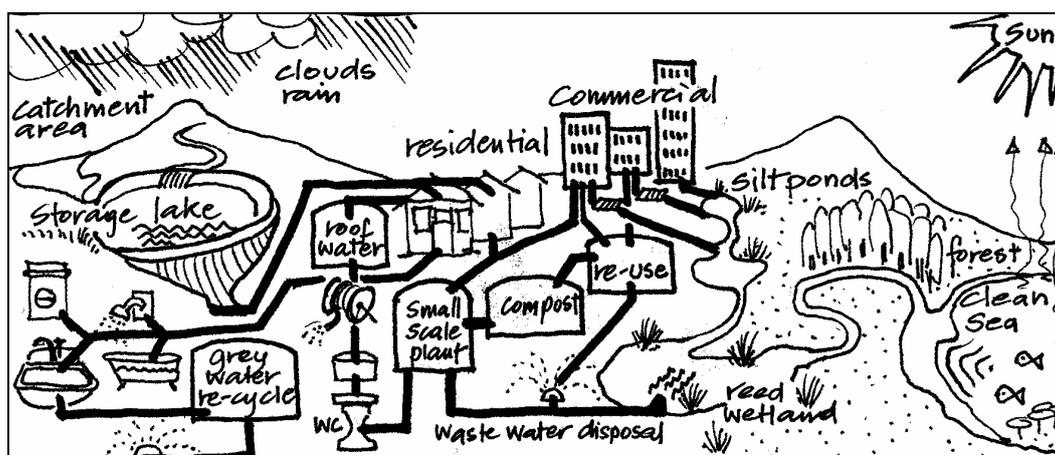
Other problems can occur if the septic tank is not properly used and maintained sewer lines can get blocked if you flush sanitary products and nappies. If large quantities of bleach and harsh detergents get into the system, they can upset the natural microbiological processes. (See the *Looking after your septic tank section.*)



Reducing the wastewater load

Wastewater is a very small proportion of human waste mixed with a lot of clean water. If we can keep relatively clean water out of wastewater the volumes that need to be treated are reduced. Stormwater should be disposed to separate stormwater drains, although it can also be collected in tanks for uses that don't need drinking quality water such as toilet flushing, laundry, and garden irrigation. Some greywater can be re-used in toilets before it finally becomes wastewater. Saving water will also help to reduce the volumes of wastewater. Greywater and stormwater do not need the same level of treatment as blackwater, and keeping them separate will reduce pressure on the treatment system (on-site as well as city systems).

The Waitakere City Council is looking at a number of options to deal with our wastes in the most sustainable way we can. One option is to aim towards decentralised treatment plants, or neighbourhood plants. This would mean that the waste is treated locally and that it does not have to be piped so far. Greywater can be reused to flush toilets after some treatment or it can be used on the garden. Wastewater can be treated to high quality and used for irrigation, while the solids can be composted. There are many more options and they need to be carefully evaluated and discussed with the community.



Sustainable wastewater system

Stormwater

Local councils manage stormwater. On average this costs every ratepayer in Waitakere \$130 a year, but this cost is expected to increase dramatically in future as infrastructure requires renewing or upgrading. To avoid flooding, runoff from hard surfaces is collected and piped into drains. From there it often runs untreated into streams and harbours.

Toxic pollutants, such as pesticides or heavy metals from cars, as well as animal wastes, oils, and sediments are mixed with the runoff. These pollute our fresh water and marine organisms and also pose a public health risk.

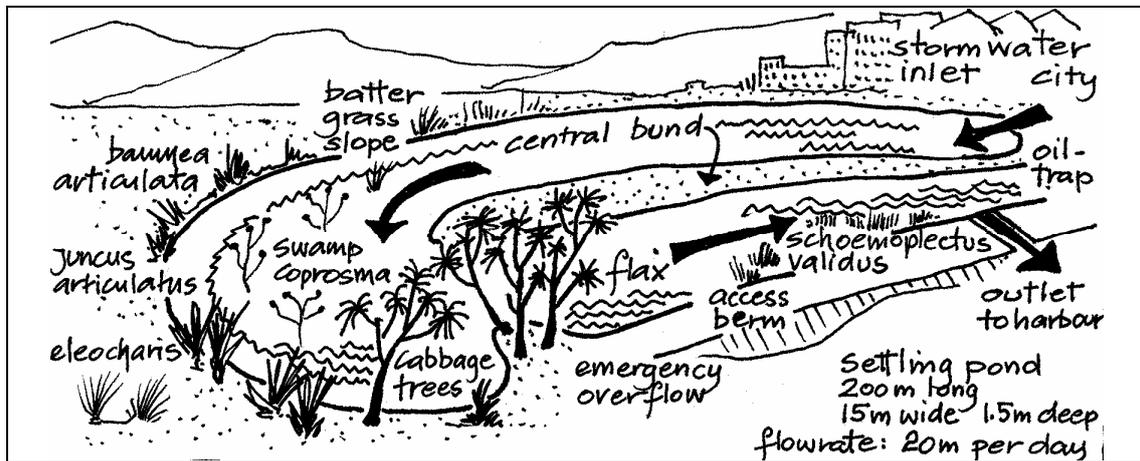


Our estuaries and harbours are poorly flushed and particularly sensitive to stormwater pollution. As a result aquatic habitat is damaged; plant and animal species decline and fishing or collecting shellfish can become a health risk. Recreational areas lose value.

Stormwater treatment

Densely populated or ecologically sensitive areas may require stormwater treatment. There are a number of installations in the Auckland area already, and stormwater treatment is becoming more common for both industrial sites and new subdivisions.

The artificial wetland system used to treat stormwater at one industrial site in Auckland uses a 200 m long pond. The water flows through slowly (it takes about 9 days) while native wetland plants (mainly rushes) help remove and settle particles. The system was engineered to give good results but similar principles could be applied to individual households on a smaller scale. Stormwater treatment systems may require resource consent, so contact your local and regional council for advice.



Stormwater treatment system



What you can do to help

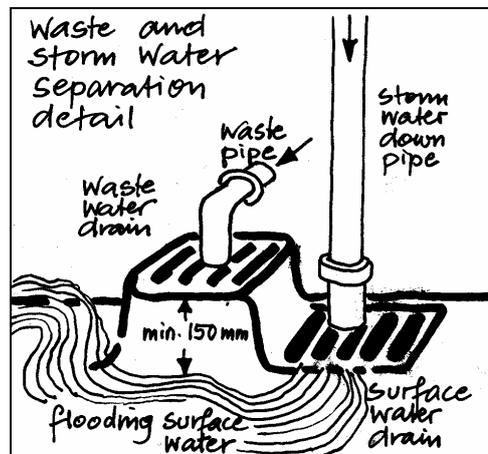
Keep pollutants out of the system

Controlling pollutants individually at the source is relatively easy, while treating them at the outflow is expensive and doesn't happen in most places. So don't just flush things away. Think about where they will emerge from the drainage system.

- Reduce the release of any pollutants into the environment wherever possible: oil leaking from your car, heavy metals from your tyres, dust from your brake linings and rust from corroding car bodies. Reducing car use reduces pollution – you can car-pool, use public transport, walk or cycle instead.
- Avoid spilling household cleaners, oils and garden sprays into home drains.
- Reduce the use of detergents and choose biodegradable brands.
- Don't clean your paintbrushes into the drain.
- Wash your car on the grass, so that soapy water and chemicals can be absorbed before draining into the storm water system.
- Be aware of potential erosion when landscaping and building.
- Use permeable surfaces such as gravel or permeable paving around your home, instead of hard surfaces, such as concrete or bitumen.
- If you have a septic tank, make sure it works well. Malfunctioning septic tanks can pollute stormwater and groundwater.

Keep your drains separate

Sewage and stormwater drains must be kept separate, because stormwater infiltration can cause sewage overflows and environmental degradation.



Stormwater can also be used to water gardens and for some industrial and household purposes. This could be an effective water management option in the future as increasing population puts more pressure on water resources. See also the *Using Rainwater* chapter.

Greywater recycling

Greywater recycling re-uses greywater from the bath and shower to flush the toilet. The water has to be treated to avoid bacteria breeding and odours. Currently there is only one system approved for greywater recycling that uses a filter and chlorine to treat the water, before storing it in a holding tank (detention tank) and pumping it to the toilet cistern. In the future more systems may become available.

Greywater can also be used on the garden, but it needs to be free of contamination. The rinse water from washing machines is generally safe for non-food plants, but other water may need further treatment. You will need a resource consent to do this.

Another option is to collect rainwater for toilet flushing and garden use. See the *Using Rainwater* chapter.

Wastewater in the Urban Areas

The national Building Code states that where a sewer connection is available, the drainage system must be connected to the sewer. On-site systems are therefore not generally an option if you can connect to a sewer. Contact the council for advice, if you are considering an on-site system in the urban area.

If you are connected to the main sewer, there are still things you can do to help the system work better. Reducing the amount of water you use is a big help, because water in equals water out (see the *Saving Water* chapter). In-sink waste disposal units put extra nutrients and wastewater into the system. It is better not to install them. You can compost your organic waste instead.

The Mangere treatment plant is designed to deal with human waste, but not with chemical pollution. Reduce the amount of toxic substances you use and don't put them down wastewater drains. Contact the Waitakere City Council for advice on the disposal of hazardous waste. Many household cleaners are toxic substances: look for the safer alternatives.

Infiltration of rainwater or groundwater into the sewage system can cause overflows and pollution. This can happen through cracked pipes, illegal connections or inadequate upstands around gully traps. EcoWater's Private Drains and Infiltration Programme has a team of engineers and inspectors to check gully traps in the Waitakere City Council for compliance.



Looking after a septic tank

Looking after your septic tank is important to ensure that it will not pollute the environment or endanger your health. The Waitakere City Council has a leaflet on how to care for your on-site system, available on the website or from council offices.

Septic tanks can be retrofitted with effluent filters to stop solids from entering the disposal field. The disposal method of the effluent can also be changed (see the section on *Effluent and greywater disposal* at the end of this chapter). If you would like to improve your existing system, contact the council and ask for a plumbing and drainage surveyor who specialises in septic tanks.

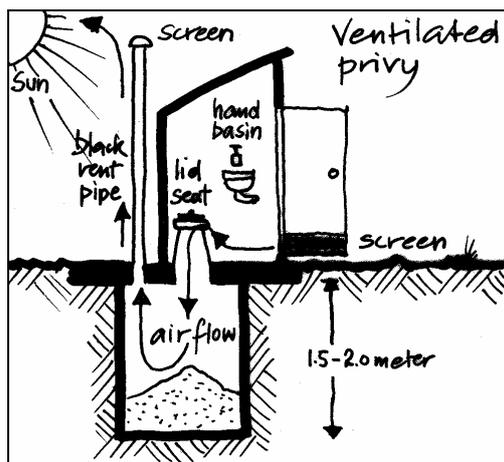
Installing a new on-site system

For an on-site wastewater system to work well it has to be suited to the individual site. Soil conditions, the size of the section and household, slopes and ground water levels are all important factors. The location and size of the system is also important.

New on-site systems are usually allowed only in the non-sewered areas of the city. They must be designed by a registered engineer familiar with effluent disposal, the manufacturer's instructions have to be followed, and a maintenance programme has to be put in place. This is to ensure that the health and environment of both your family and neighbours are protected. If you are considering a new system contact the council and ask to speak to a plumbing and drainage surveyor who specialises in septic tanks.

The following list covers the most common systems.

The **long drop** is a simple hole in the ground in a separate building from the house, away from water tables. This is not the most preferred option.



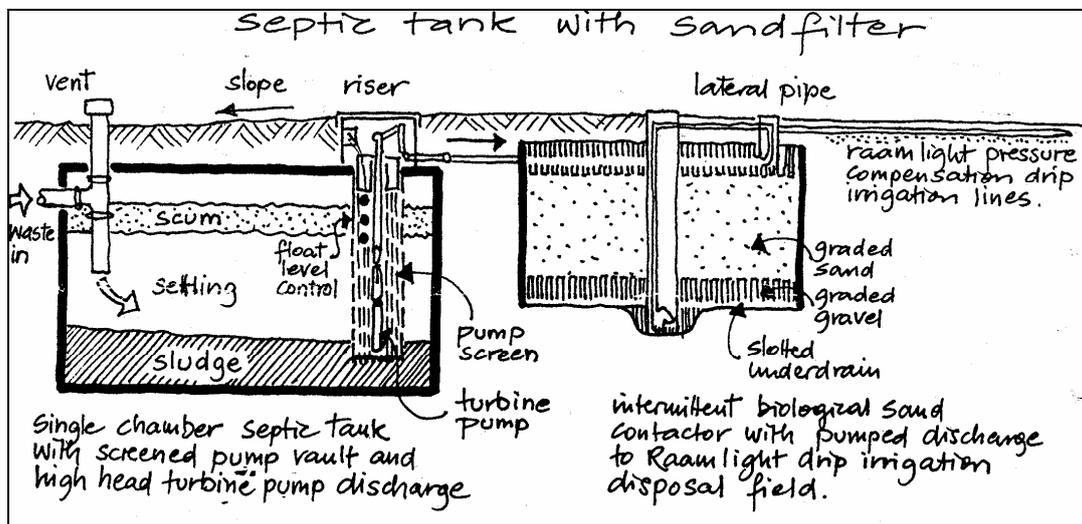
The **Ventilated Privy** has a similar set-up to the long drop, with the addition of a vent pipe to help reduce odours. Another variation (aqua privy) contains the waste in a water tank. This will prevent seepage into the water table but does not solve the problem of anaerobic storage.

The **septic tank** has been used widely in the past and still serves many households today. It pre-treats domestic wastewater before it enters the disposal field where natural processes are expected to take care of the final treatment. Solids settle to the bottom of the tank and form a layer of sludge, which is removed by a contractor approximately every three years. Lighter wastes such as grease and fats float to the top, forming the scum layer. This layer prevents some of the offensive odour from escaping. Anaerobic

breakdown (using bacteria that can live without oxygen) treats the waste in the tank to a certain extent. Each time new waste is discharged into the tank, the same amount of pre-treated effluent flows out into the disposal bed where it is exposed to the air and broken down further.

Well-designed and sited septic tanks can work satisfactorily, but the owner needs to maintain them. Failures can result from poorly sized and sited tanks, inadequate disposal fields, extreme weather and ground conditions (such as clay soils or high ground water levels) and inappropriate occupant behaviour and lifestyles (large water use from modern appliances, use of toxic household chemicals etc.). Failure of septic tanks can result in widespread environmental damage such as the pollution of some of our West Coast streams and lagoons. This is why they are now seldom installed as the sole treatment system.

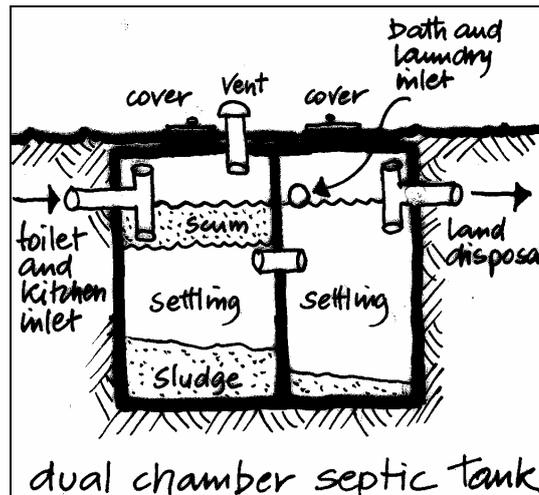
A common and very satisfactory solution nowadays is to add an aerobic sandfilter to the outlet of a conventional septic tank.



Based on one of Innoflow Technologies' systems

The sandfilter treats the effluent from the septic tank to a very high quality and the final product can be used for garden irrigation, or it could be re-used for toilet flushing. Like all on-site systems this system needs to be covered by a service maintenance agreement.



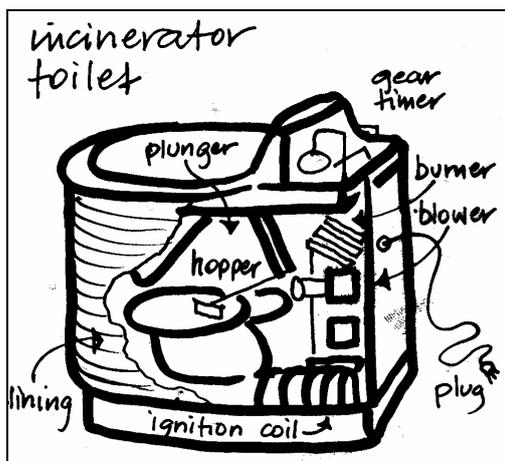


The **dual chamber septic tank** is similar to the septic tank, but has two chambers. Only toilet and kitchen wastewaters pass through the first chamber. Wastewater from the bathroom and laundry is added at the second chamber. This design avoids some of the problems of single chamber septic tanks, because large discharges from the laundry will not result in untreated toilet waste flowing into the disposal field.

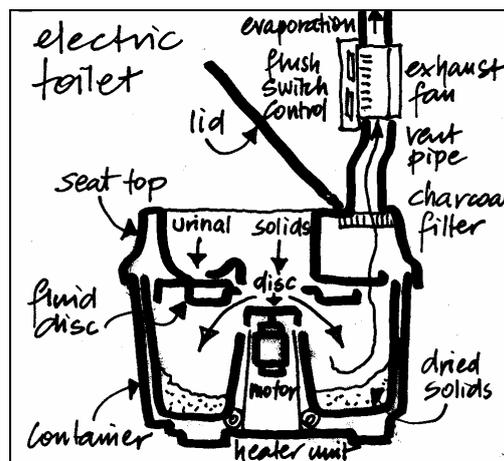
Aerobic treatment plants offer a mechanical solution to wastewater treatment in an aerobic treatment tank with drip irrigation onto the garden. The wastewater is aerated by having air bubbled through it, and aerobic bacteria break down the waste. These systems require energy and ongoing maintenance.

The **incinerator toilet** uses combustion and venting to resolve odour and contamination problems, but it does not return any valuable matter to nature and uses significant energy.

The **electric toilet** mixes and aerates the effluent on a rotating disc, then heats and evaporates the liquids by venting through an automatic air extraction system. This reduces the original waste volume by 90% to dry turf, which can be composted. This is an ecological solution with relatively high running costs.



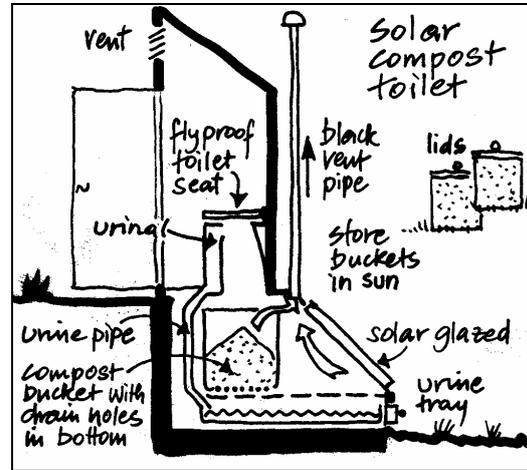
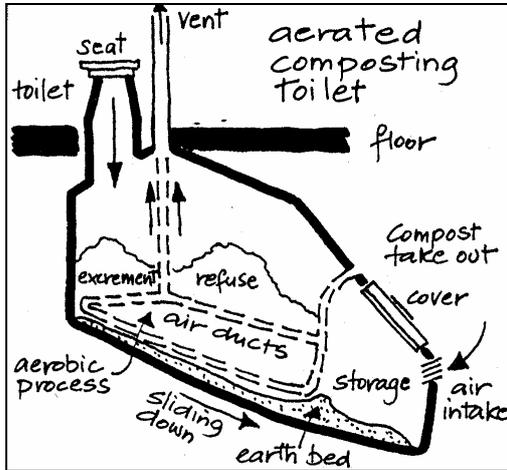
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Based on 'Lectrolav'

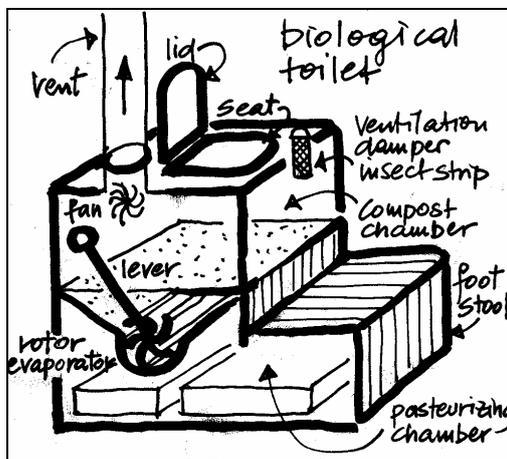


The **aerated composting toilet** is a true composting toilet with an aerated storage tank. The waste is mixed by gravity, while venting and aeration is achieved by the thermosiphon principle. The tank requires space to install below the bathroom.

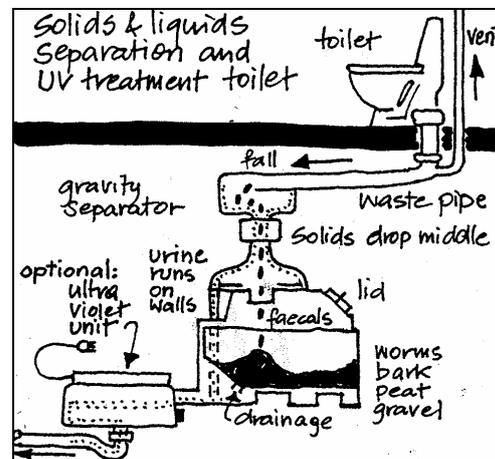


The **solar compost toilet** is a simple natural solution, allowing for composting, heating by solar radiation, and venting by thermosyphon. Solids and liquids are separated; flies and odours are controlled by a perforated tray. The compost is removed by swapping buckets.

The **biological toilet** is an environmentally friendly system, which requires some energy input to keep the waste rotating, heated and vented.



Based on 'Mullbank'

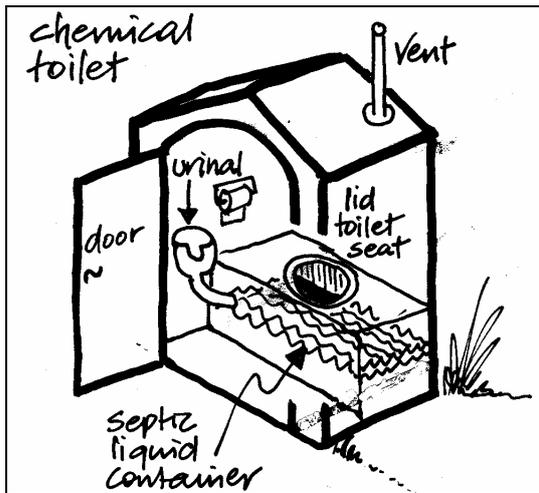


Based on 'Aquatron'

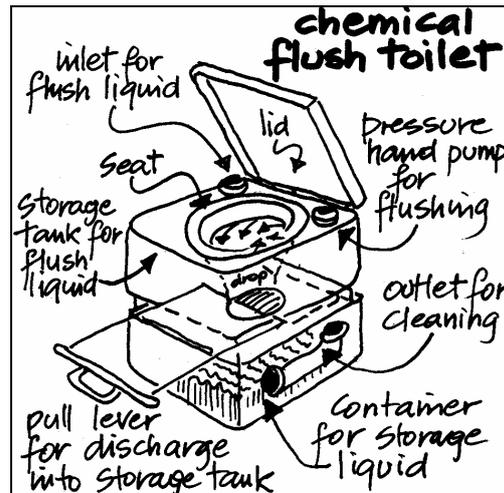
Solid/fluid separation systems are mechanical equivalents to the solar composting toilet, separating solid and liquid effluent, while providing a conventional flush toilet. The solids are composted with the help of worms, while the liquid is disposed of after further treatment. Some systems allow for the reuse of the cleaned effluent for toilet flushing and other uses. The system can be placed underneath the toilet or outside in a shed or underground.

The **chemical toilet** and **chemical flush toilet** are only for temporary situations. They treat the waste with chemicals to resolve odour and contamination problems. Further processing and proper disposal are still required.





Based on 'Port-a-loo'



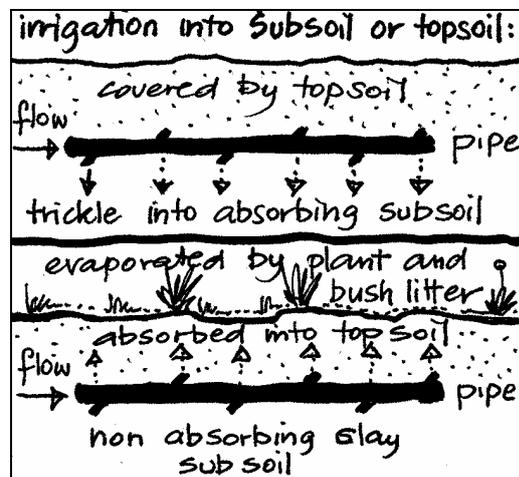
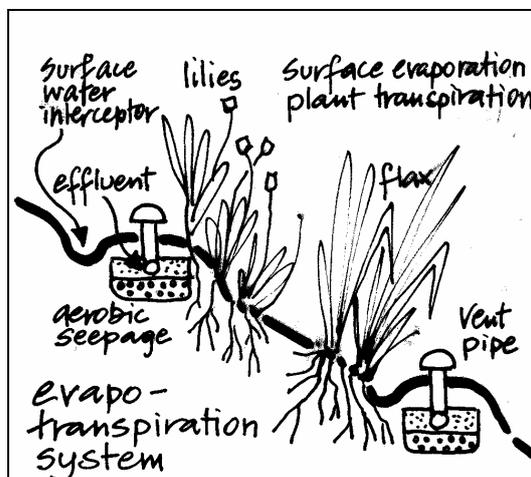
Based on 'Porta potti'

Effluent and greywater disposal

Once the wastewater has been treated by a septic tank or another water-based system, the final effluent is either further treated or disposed of. Where a dry toilet system, such as a composting toilet, is used, greywater from washing, etc., still has to be treated and disposed of. The following list is not exhaustive, but gives some examples of possible solutions to disposing of effluent.

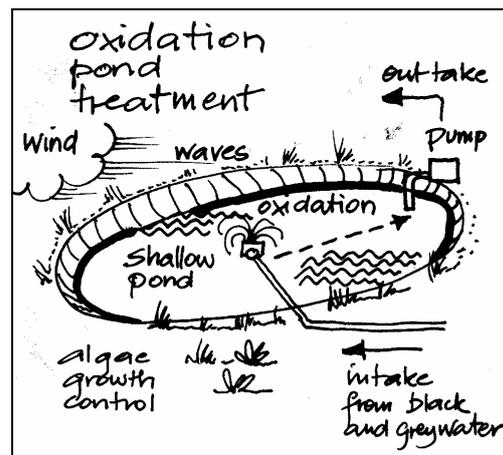
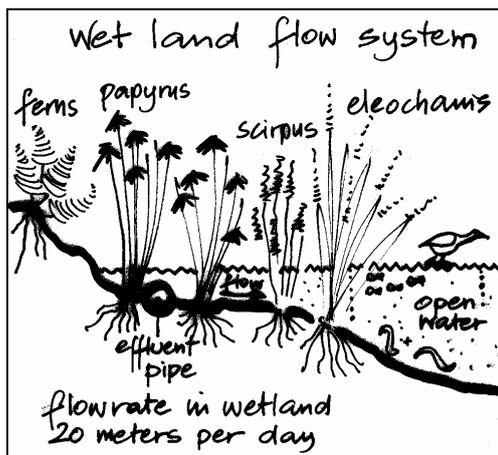
The **sand filtration system** uses various grain sizes of sand and gravel. It will take out some pollutants from blackwater and greywater, but not chemicals or sludge, which should be dealt with beforehand in a retention tank. The final effluent can be used for garden irrigation.

Evapo-transpiration systems use sub-surface soakage and evapo-transpiration from selected plants. The plants absorb effluent into their root system and then release water to the atmosphere through their leaves. **Aerobic Soakage Beds** are a similar system using shallower narrower beds. The effluent is also dosed so that a larger amount can be released into the system at one time.



Compensated dripper-lines are covered with bark or mulch and discharge the effluent to the ground. They are laid around bush and landscaped areas (not vegetable gardens) and can be used as irrigation.

Wetland flow systems can be either subsurface or surface operated. In the former the effluent is percolated over several days through gravel beds and aquatic reeds, on top of impermeable clay soils. A surface system needs a slow surface flow of 10-20 cu m per day through aquatic reeds. These systems purify water in a very natural way, but because of the need to design and size them correctly to avoid pollution of waterways, **Auckland Regional Council approval has to be obtained.**



Sub surface irrigation

In an **oxidation pond** system the effluent is disposed into the centre of a shallow pond, where wind, oxidation and algae allow for aerobic treatment. **Auckland Regional Council approval has to be obtained for this system.**



Further information

Advice at the Waitakere City Council:

Phone the call centre (09) 839 0400

Ask for: Ecowater Customer Services
 Building Consents
 Duty Planner

In print

Your Home Technical Manual, Australian Government. Comprehensive printed resource, much of it relevant to New Zealand.

TP (Technical Publication) 58, Auckland Regional Council.

EcoWater Brochure: A guide to the management of your onsite wastewater system.

On the web

www.oasisdesign.net an excellent source of information and products on wastewater.

www.smarterhomes.org.nz is a mine of up-to-date and independent information. Designed for the general public, it's easy to use, has case studies, and includes features such as Homesmarts, a calculator you can use to find information relevant to your needs or simply to run a home-health check.

If there are questions you can't find answers to on Smarterhomes, www.level.org.nz goes into more depth and is aimed at the design and building industries, with drawings and links to Building Code compliance documents.

Eco-building Products and Services Directory, Building Biology and Ecology Institute, phone Auckland (09) 376 6767, Wellington 0800 223 272. This is updated regularly and can be obtained from the website www.ecoprojects.co.nz.

This chapter was last reviewed in September 2008.

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Systems and suppliers

Septic tanks:

Normanby Fibreglass; PO Box 383, Hawera, Ph (06) 272 81 62
Humes; PO Box 12 285, Penrose, Auckland, Ph (09) 622 15 26
Ribtec Central Limited; PO Box, 10487, Hamilton, Ph (07) 849 10 33
MJ McKendry Limited - Envirotank Z5000; Christchurch, Ph (03) 338 38 01

Effluent filters incl. sandfilters:

Innoflow Technologies Limited; PO Box 89013, Torbay, Auckland, Ph (09) 415 7697
Zabel Effluent - Normanby Fibreglass; PO Box 383, Hawera, Ph (06) 272 81 62
Reflection Treatment Systems; Ph (09) 416 94 75 or (021) 651299

Aerobic treatment plants:

Biocycle (NZ) Limited; PO Box 15084, Glendene, Auckland, Ph (09) 818 23 40
JET Home Plant; Waste & Water Systems, PO Box 302241 NHPC, Auckland, Ph (09) 415 1538
Hynds Clearwater Systems - Taylex Clearwater 80/90; 6 Cowley Place, Albany, Ph (09) 415 4530
or (021) 389 713

Solid/fluid separation systems:

Dowmus (NZ) Ltd. – Biolytic Filtration, PO Box 42, Whitford, Auckland 1750, Ph (09) 530
8011 or 0800 369687, e-mail: gmacindoe@dowmus.co.nz
Eco Toilets - Aquatron; PO Box 10, 279 Te Rapa, Hamilton, Ph 0800 50 75 74

Chemical toilets:

Port-a-loo; 102 Captain Springs Road, Onehunga, Auckland, Ph 09-636 6189
Port-o-let; Waste Management, 86 Lunn Ave, Mt Wellington, Auckland, Ph 09-527 1300
Porta Potti; Lewis Grey Limited, PO Box 302060, North Harbour Post Centre, Auckland 1331,
Ph (09) 415 33 48

Greywater disposal:

Eco Toilets - Grey Water System; PO Box 10, 279 Te Rapa, Hamilton,
Ph 0800 50 75 74

Greywater recycling:

East Coast Wastewater Recycling Systems Ltd.; 45 Kennedy Road, Napier,
Ph 06-835 6213 or 025-571 602

The Waitakere City Council does not endorse any of the above systems, but all are approved for use in Waitakere. We recommend that you contact the suppliers for more detailed information. If you are a supplier and would like to be added to the list, please contact the council's Plumbing and Drainage Inspector on 836 8000 Ext. 8664.

