Port Stephens
C·O·U·N·C·I·L
... a community partnership

The Home Owners' Guide To On-Site Sewage Management

December 2008

Table of Contents

1. Introduction

Port Stephens is fortunate in its diversity of environmental landforms, especially its waterways. It is therefore important that council, business and residents take an active role in the protection of these fragile and sensitive areas. There are approximately 4500 properties within the local area currently using some type on-site sewage management system. Management of these systems is an important issue when considering the environment and public health. Everyone has a responsibility in ensuring that on-site systems have minimal impacts on the environment and health in such areas as:

- Protection of ground and surface waters;
- Prevention of degradation of land and vegetation systems;
- Protection of activities that are dependent on waterways (oyster and aquatic industries, swimming and tourism);
- Minimising health risks to individual families; and
- Minimising health risks to the broader community.

This guide has been designed to provide information and assistance to persons living in the Port Stephens area who currently use an on-site system or who may be thinking of building a dwelling in a part of the shire not serviced by a reticulated sewage system. It specifically provides information relating to:

- The current legislation and regulations;
- The process of Installing an On-Site System;
- The Inspection Program; and
- Types of Approved On-Site Systems available;

2. The "Approval to Operate"

Legislative reforms previously carried out by the NSW State Government have transferred the responsibility for managing on-site sewage systems from the State Government to local councils and landowners. This has meant that Councils and landowners must be take a more hands on approach in ensuring that the systems are installed, operated and maintained in a much more effective manner in order to minimise and even eliminate adverse impacts on the environment and public health. Now all on-site sewage management systems must have an associated **"Approval to Operate"** as specified under Section 68 of the Local Government Act, 1993.

If your name is specified on the **"Approval to Operate"** then you are the designated person responsible for the system. This means that the approval is **personal** and relates to the actual activity of sewage management, not the facilities themselves. With this in mind, you must take reasonable steps to prevent the following:

- The transmission of disease and spread of foul odours;
- The pollution of water and degradation of land;
- Any discharge to a water course; and
- Any discharge to land other than the approved land disposal area that may occur as a result of on-site sewage management activities.

These regulations apply to all new, altered and existing systems.

All Approvals contain a set of conditions (**refer Appendix 1**) which outline the best management practices for system types nominated on individual applications and will be renewed annually or when the property changes ownership. Owners of existing systems are advised to operate their systems in accordance with these conditions until the initial inspection by council takes place. It is important that your approval to operate is kept up to date. Failure to renew your approval annually may impose an on-the-spot fine of $330.00.

Owners who have not yet made an application for an "Approval to Operate" are advised to contact Council to obtain an application form.

Operation of On-site Systems WITHOUT an Approval in NSW is an offence with penalties of up to $2,200 in the Local Court

3. System Inspections

Council officers have been carrying out inspections of on-site sewage management systems since March 2000. It is expected that the majority of properties in the Port Stephens Council area will have received at least one inspection within three years. After the initial inspection, septic systems will be classified as high, medium or low risk and further inspections will be carried out at a frequency based on this risk assessment. The classification

HIGH RISK – 2 years	MEDIUM RISK – 2-3 years	LOW RISK – 5 or more years

- Aerated systems currently being serviced by approved service providers will be classified as either Medium or Low Risk once Council determines that individual systems meet the performance standards outlined in the Legislation and the On-site Sewage Management Strategy.

- The inspection process aims at identifying problems with the operation of septic systems. It will also be an ideal time for owners to receive advice on the best operation and management practices to improve the performance and life expectancy of their individual systems.

- Prior to an inspection taking place residents will be informed, in writing, of the proposed inspection date. If for some reason the date specified is not suitable, or you wish to be present at the inspection, the Council officer will need to be notified by phone to make alternative arrangements. **If residents are not at home when an inspector calls, the inspection will still be performed**. After the inspection, all owners will be forwarded an audit report on the assessment of their system. The correspondence will also contain any advice relating to the operation or maintenance of individual systems and may require action by the owners if the system is found to be failing.

4. Installation of a New System

If you are planning to install a new system there are a number of important steps that must be followed to ensure appropriate regulatory requirements are met, and that the system of choice is in fact the most appropriate system type for your needs and for the location. Remember that doing your homework at step 1 of the installation process can save time, money and much heartache.

Step 1 – What Type of System Can I Install?
The type of system that is to be installed will ultimately depend on the size, location and the physical characteristics of the property. Environmental constraints and management issues may also play a part in determining the system type. Only those systems that hold current accreditation with the NSW Department of Health may be installed. A list of accredited systems may be obtained by contacting Council, or by visiting the Department of Health website:
www.health.nsw.gov.au/public-health/ehb/general/wastewater/wastewater.html

Examples of environmental and physical constraints are:

- Property Size - Currently within Port Stephens, the minimum size of the property that an aerated water treatment system (AWTS) may be installed on is 4000 square metres (m^2) or 1 acre. Smaller properties may require the installation of a pump-out system though this will be at the discretion of Council;

- Environmental Constraints – Restrictions may be placed on properties located in close proximity to waterways, dams and drainage channels and properties situated in areas with high groundwater tables;

- Other Constraints – Other limiting factors that can affect the type of system allowed for installation include, slope of the property (steepness) and type and depth of soil.

It is also recommended that you read the Waste Water Section (B2.12) in Councils **Development Control Plan, 2007** and associated **On-site Sewage Management Specification**. These 2 documents will provide a significant amount of information to assist you in the application and system selection process (see step 3).

Step 2 – Contact Council

You will need to contact council either by phone or by visiting council chambers to obtain the relevant documentation and any other helpful information. The documentation required for the installation of a Waste Water Treatment Device **must** include the following:

- Application Form – Application for Approval to Install a Waste Treatment Device and Approval to Operate an On-Site Sewage Management System;
- Manufacturers specifications of the tank(s);
- A site report – Single Site Assessment Report (available from council). This will usually need to be completed by a plumber, system installer, wastewater professional or civil engineering firm;
- A Wastewater or Geo-technical Report (if applicable or requested by Council);
- Floor plans of any dwelling or building that will be connected to the waste treatment device;
- Site Plan for any **On-Site Disposal** detailing; buffer distances (m) from dwelling, boundaries, paths, driveways, swimming pools, dams, drains and any other sensitive landform. Locations of the primary and reserve disposal areas. Storm water diversion drains and down-slope bunding;
- When an aerated water treatment system (AWTS) is to be used, the applicants must supply: Design plans of the disposal area, calculations for the disposal area (both hydraulic loading and nutrient balance) and details of the maintenance agreement with the service provider.

Reference to the matrix below will indicate what information is required specific to each system type.

Table 1: Council Requirements for Installation of a Waste Management System

System Type	Application Form	Tank Specifications (NSW Health Accredited)	Single Site Assessment Report	Geo-technical Report	Floor Plans of dwelling/other buildings	Calculations Associated with Disposal Area	Site Plan (detailed)	Other Requirements
Pump to sewer	✓	✓	-	-	✓	-	✓	-
Pump-Out	✓	✓	-	-	✓		✓	Minimum holding well capacity of 5250litres
Septic Tank and Transpiration or Absorption Area	✓	✓	✓	If requested by Council	✓	✓	✓	Generally no longer permitted
Aerated Wastewater Treatment System (AWTS)	✓	✓	✓	If requested by Council	✓	✓	✓	Maintenance agreement with service provider Subsurface irrigation required
Wet Composting System	✓	✓	✓	If requested by Council	✓	✓	✓	Must produce effluent of secondary standard Subsurface irrigation or absorption trench May require active disinfection
Dry Composting System	✓	✓	✓	If requested by Council	✓	✓	✓	Details of grey-water disposal

Three copies of each plan, specification sheet or report are required on submission of the application (excluding the application form, single site assessment report or geo-technical report).

Step 3 – System Investigation and Selection

Once you have established the type of system or systems that are appropriate for your property you should investigate which type you wish to install. You will need to contact the various manufacturers, installers and plumbers and obtain more detailed information about each system in order for you to make an informed decision. Council requires that all construction work be carried out by a "suitably qualified tradesperson". This means a plumber and drainer (or equivalent) licensed with the NSW Department of Fair Trading with qualifications and experience in the installation of on-site wastewater systems.

Remember there are basically three components to an on-site wastewater management system:

- The primary treatment system (which gives an initial treatment);
- The secondary treatment system (which gives further treatment of wastewater to reduce both levels of nutrients and micro-organisms); and
- The land application area (where the effluent is distributed to the soil by subsurface methods).

There are also optional treatment systems available that can be used in combination with standard systems to provide a superior level of treatment in relation to reducing nutrients and harmful microorganisms. Examples of optional treatment systems include aerated sand filters, Wisconsin mounds and more rugged forms of subsurface trenching. This can offer advantages such as:

- Reducing the area required for land application disposal;
- Providing a means of land application when standard methods are inappropriate (e.g. properties with high water tables).
- Providing a better quality effluent in general.

If you have a property with specific environmental constraints it may be necessary for you to talk with a system designer or wastewater consultant. They will be able to provide advice on system design in order that it meets all regulatory requirements. Always insist of being involved in the system selection and design so that any landscaping or resource re-use requirements can be incorporated.

Step 4 – Complete the Application and Other Required Documentation

The Application Form - complete all the required information on the application form. It is important that all the information be supplied and that the application form be signed by both the applicant and owner (if applicant is not the owner). The council, manufacturer, plumber or wastewater consultant will be able to provide assistance if needed. Specific information relating to the "Septic System" and "Installation Firm Details" will need to be filled out by the relevant persons or company.

Single Site Assessment Report – This report provides information to Council specifically about the site and the type of system and disposal method chosen. This enables Council officers to assess whether the selected system and the method of disposal is appropriate for not only the site but also that it fits into the long-term strategy developed for the area by Council. If the type of system chosen requires a "Single Site Assessment Report", this will need to be completed by either the installation firm or geo technical consultant. There are a number of sections in the document that requires specialist knowledge to complete. One section requires the classification of the soil type within the land application areas. Soil test holes will need to be excavated to a depth dependent on the type of disposal method. The test holes must be clearly pegged and left safely open to allow Council officers to view them if required.

Tank or System Specifications – Specification of either the system or tank(s) must be included with the application. The system must hold accreditation with the NSW Department of Health and the specifications must display the NSW Department of Health Stamp. The tank(s) must also be manufactured to the relevant Australian Standard.

House Plans – Floor plans are required of any dwelling or building that will be connected to the waste treatment device. The important aspects of the floor plan are the number of bedrooms and the number and type of "wet" areas such as bathrooms, toilets, laundry and kitchen. If a spa bath is to be installed then this should be indicated in the application or on the floor plan.

Site Plan/Disposal Area Plan/Calculations – If you have selected a system that is using some method of on-site disposal then a detailed plan of the land application area will be required. The plan(s) needs to be comprehensive and must show the following key points:

- ❑ The location and buffer distances of any boundaries, dwelling, pathways, driveways, swimming pools, dams, drainage channels, permanent waterways (lakes, rivers, creeks etc) or groundwater bores on the site in relation to the primary land application area.
- ❑ The location of the tank(s), primary land application area and if relevant the reserve land application area.
- ❑ The dimensions of the primary land application area.
- ❑ The location and dimensions of any storm water diversion drains or down-slope bunding.
- ❑ When an aerated system is selected, the installation company, plumber or geo technical consultant must also supply details of how they calculated the size of the land application area. **Calculations detailing both hydraulic loading and nutrient balance are required**.

Other Relevant Information – Depending on the type of system it may be necessary to provide other specific information. Refer below to check if more information is required:

- ❑ Aerated systems – you must supply a copy of the maintenance agreement for the servicing of the AWT system. AWT Systems must be serviced on a 3-monthly frequency.
- ❑ If you are installing a dry composting unit, details of the disposal of the grey water must be supplied to Council. Grey water disposal is regulated, so ensure that the disposal plans meet the relevant guidelines.

Remember

Ensure that all information submitted is correct

Later changes may be costly and could slow the approval process

Step 5 – Submit Your Application and Plans to Council

When you have completed all the necessary applications and obtained the required documentation, you can submit it to council for assessment. Payment of the application fee (refer to Councils schedule of fees and charges) must be paid on submission of the application. Normally the application will take approximately 10 working days to process. If for some reason Council requires further information to assist in the approval process you will be contacted in writing requesting the necessary information.

Inspections may be required at various stages of construction, including:

- Site pre-approval;
- Drainage from house to treatment system;
- Open Trench and installation of irrigation disposal system; and
- Final inspection on completion of works.

Step 6 – After Completion of the Installation

Once the treatment system (and land application if required) has been installed in accordance with the approved application, you will receive a letter from Council confirming that the system meets all requirements. At this point you will also be issued with an "Approval to Operate". The "Approval to Operate" is for a period of 12 months, after which you will be sent a renewal notice. An inspection of the system will also take place 12 months from the issue date of the initial "Approval to Operate" as a follow up in ensuring that both the system and land application area are functioning correctly. If no remedial work is required the system will be classified according to set criteria and will be placed on a risk particular rating accordingly.

If the after the installation the final inspection identifies deficiencies in either the treatment system or land application area, you will be notified in writing in the form of a "Notice of Intention to Serve an Order". This document is issued under the provisions of Section 124 (30) of the Local Government Act, 1993 and will specify why the order is being served, what actions are required to comply with the order and the period of time in which the proposed order must be complied within. If no representations regarding the details of the order are made to Council within the specified time frame then the proposed order will be served. Works required are to be completed within the specified time frame.

5. Types of Systems

There are many different types of systems available for the treatment of wastewater, each providing different levels of treatment. The more typical ones are described below. More detailed information is available from Council and the Manufacturers.

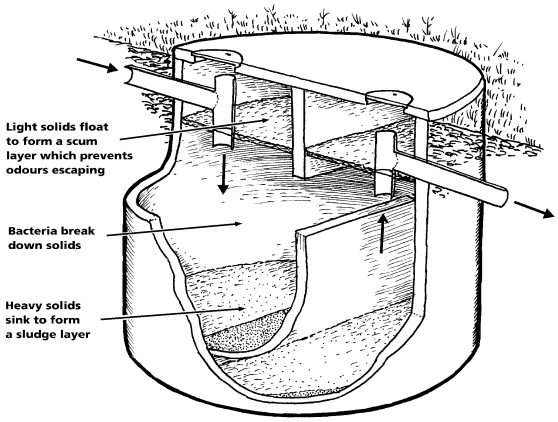
Primary Treatment Systems

Septic Systems

What is a Septic System?
Septics are the most common type of system currently in use. A septic system consists of a septic tank combined with a soil absorption system and/or transpiration beds or pump out connections. The system enables people living in un-sewered areas to treat and dispose of their sewage.

A septic tank is a structurally sound watertight tank (usually concrete) used for the treatment of sewage and liquid wastes from a single household or multiple dwellings.

How does a Septic System work?
All the wastewater from a household enters the tank. Most of the solids settle to the bottom and are retained in the tank forming a sludge layer, whilst fats and greases collect at the top in a scum layer.



Anaerobic bacteria in the septic tank break down the solid matter in the sludge and scum layers. Material that cannot be fully broken down gradually builds up in the tank and must be pumped out periodically.

There are three ways to dispose of septic tank effluent:

- **On-site application**

The effluent flows via gravity or is mechanically pumped from the septic tank to transpiration or absorption areas. Here the effluent is mainly absorbed into the soil and partly evaporated by the sun and used by vegetation (usually grass).

Such application systems have the potential to contaminate groundwater and are not recommended in sensitive locations or in higher density developments. Further treatment of the effluent followed by subsurface irrigation should be considered.

- **Pump Out**

The effluent flows from the septic tank into a collection well or holding tank. At regular periods, a tanker pumps out the holding tank and transports the effluent to an off-site management facility for treatment.

- **Common Effluent System**

The treated wastewater is transported to an off-site management facility through a network of small diameter pipes.

Advantages

- Low maintenance requirements
- Low energy requirements
- Generally no moving parts

Disadvantages

- Poor quality effluent – highly infectious
- Below ground disposal of effluent is required
- Unsuitable for sensitive areas close to waterways or with high groundwater levels
- Generally systems are poorly maintained

Council Requirements

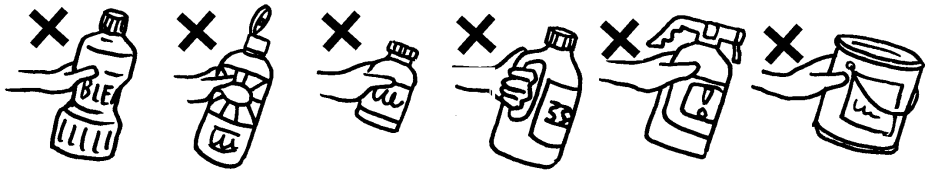
The following minimum requirements apply to the septic tank and land application area:

- The minimum tank size that must be installed is 3000 litres. A larger tank may be required dependent on a number of factors including the number of bedrooms and the source of water (mains or tank).
- Pump-out systems require specific sized solids tank and holding well. Contact council for advice.
- "T" junctions must be installed on both the inlet and outlet sides of the tank.
- It is recommended that an outlet square filter be installed into the outlet "T" junction of the tank. This device increases the longevity of the disposal area by preventing the carry over of small particulate matter.
- The disposal area must be sized correctly, based on the number of bedrooms within the dwelling, the soil type, the location of the property and whether the water supply is reticulated or tank water. Either a Council officer or a professional with knowledge in the field of wastewater management must calculate the disposal area size.
- A diversion drain must be constructed on the upslope side of the disposal area. This reduces surface wet weather flows over the disposal area.
- Council will generally not approve the installation of a primary treatment and disposal system.
- Approval for the installation of effluent pump-out systems are subject to stringent requirements and only permitted as an option of "last resort".

Maintaining your Septic System

The effectiveness of the system will, in part, depend on how it is operated and maintained. The following is a guide on how to achieve the most from your system.

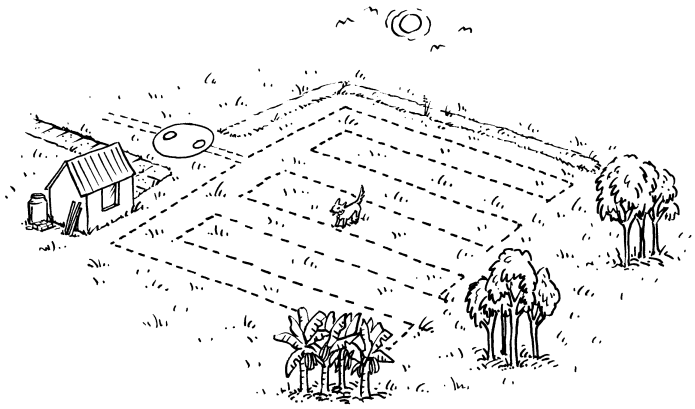
DO	DON'T
✓ Have your septic tank de-sludged every three to five years to prevent sludge build up, which may 'clog' the pipes and absorption trenches.	× Don't put large quantities of bleaches, disinfectants, whiteners, nappy soakers and spot removers into your septic tank via the sink, washing machine or toilet.
✓ Have your grease trap (if installed) cleaned out regularly.	× Don't allow any foreign materials such as nappies, sanitary napkins, condoms and other hygiene products to enter the system.
✓ Keep a record of pumping, inspections, and other maintenance.	× Don't use more than the recommended amounts of detergents.
✓ Learn the location and layout of your septic system and land application area.	× Don't put fats and oils down the drain and keep food waste out of your system.
✓ Check household products for suitability for use with a septic tank.	× Don't install or use a garbage grinder or spa bath if your system is not designed for it.
✓ Use biodegradable liquid detergents, such as concentrates with low phosphorous and low sodium.	× Medicines/antibiotics can also kill the essential bacteria in your septic system.
✓ Ensure your tank is mosquito-proofed.	× Don't allow livestock to graze on the absorption/transpiration area. This can lead to compaction and collapse of the area.
✓ Conserve Water.	
✓ Regularly maintain the disposal area. Long grass and weeds reduces the evapo-transpiration efficiency.	



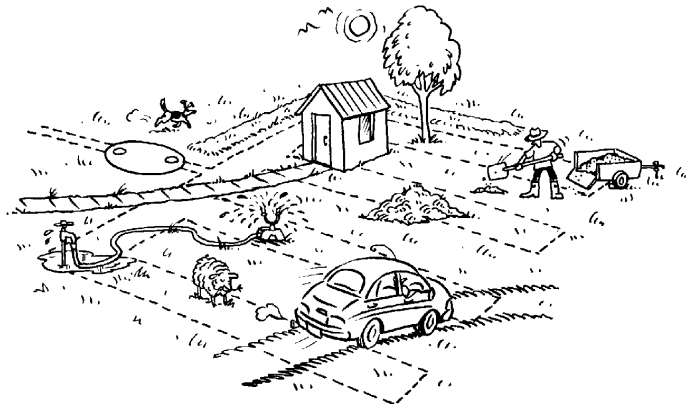
Warning signs to look out for

You can look out for a few warning signs that signal potential problems with your septic tank. Ensure that these problems are attended to immediately to protect your health and the environment. Call a licensed plumber or wastewater technician to service the system.
Look out for the following warning signs:

- Water that drains too slowly when emptying the bath or kitchen sink. This may indicate that your septic system is already failing.
- Drain pipes that gurgle or make noises when air bubbles are forced back through the system.
- Sewage smells inside the house, from the tank or disposal area – this could be indicative of a serious problem.
- Wastewater surfacing and ponding within the land application area.
- Weeds growing on the shore if the system is near a waterway.



This is a well-maintained absorption area



Don't treat your absorption area like this

Wisconsin Mound Systems

Wisconsin mounds were developed in the United States in the 1970's as a system designed to treat and dispose of human wastewater in areas identified as generally unsuitable for conventional septic tank and soil absorption systems. Over the years the design of the mound has been modified and improved to the present design that if sized and installed correctly is capable of appropriately disposing of domestic wastewater in a number of locations within the Port Stephens Local Government Area that have specific site limitations making them unsuitable for conventional systems.

Mounds are pressure-dosed sand filters constructed above the natural ground surface and discharge indirectly to the natural soil. Their main purpose is to provide additional treatment to domestic effluent that has already undergone either primary treatment in a septic tank or secondary treatment in a secondary treatment system. Mound systems are designed to overcome site restrictions such as:

- Highly permeable soils (sands);
- Slowly permeable soils (clays);
- High groundwater tables;
- Shallow soil cover over creviced or porous bedrock.

There are three components to a mound system, these being a pre-treatment tank, dosing or pump chamber and the elevated mound (refer figure 1).

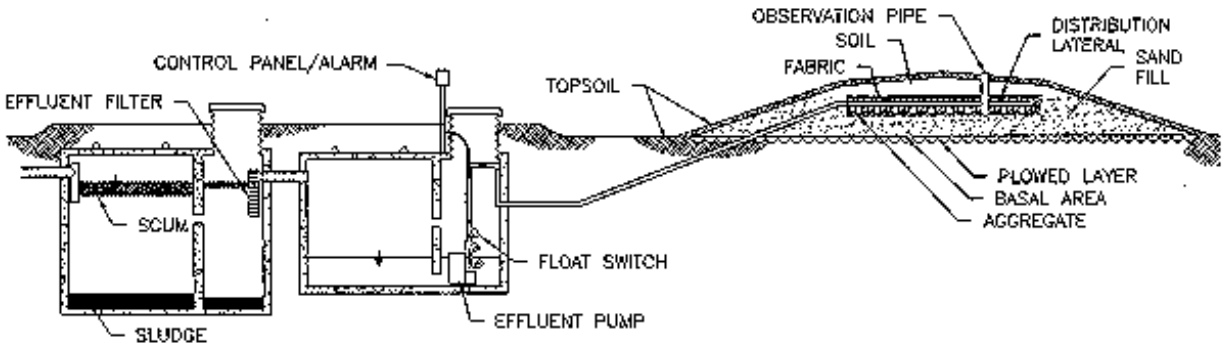


Figure 1. Schematic of a Septic-Wisconsin Mound Wastewater System ***(Source Converse and Tyler (1987a), copyright © by the American Society of Agricultural Engineers)***

The pre-treatment tank can be a septic tank (primary treatment), a wet composting treatment system (enhanced primary treatment) or a secondary treatment system such as an aerated wastewater treatment system (AWTS). Whichever system is used, the main purpose is to remove suspended and organic materials from the wastewater. Pre-treated effluent flows from the pre-treatment tank into a dosing or pump chamber that contains a pump.

The pump distributes the effluent into pipework within the mound where it is evenly distributed over the infiltration surface.

The mound is made up of layers of sand, non-crushed gravel aggregate through which a network of small diameter perforated pipes is placed, a permeable fabric and a soil cover that has an established grass cover. The network of perforated pipes distributes the effluent evenly over the gravel aggregate from where it moves vertically through the sand layer and then into the natural soil. The effluent receives treatment through physical, biological and chemical means as it filters down through the aggregate and sand layers. Once it reaches the natural soil the effluent has been treated to a level considerably superior to that obtained within conventional absorption trench systems. If a mound is used in conjunction with a pre-treatment system providing a higher level of treatment than a septic tank then the quality of effluent reaching the natural soil is of an even higher standard.

When a mound system is installed properly, it should continue to operate for a considerable period of time. It should be noted that the greater the level of pre-treatment the better the mound will operate and the longer it will last. Another factor that determines the performance and lifespan of the mound is the type of sand that is used in the construction. Coarse sand with a specific grain size and uniformity coefficient must be used to ensure the correct flow rate of effluent occurs vertically through the mound. A mound should always be installed by a licenced tradesperson with suitable experience in their construction.

Maintenance requirements for a mound system are generally low. Maintenance issues to consider include:

- A desludge of the pre-treatment tank and pump well should be performed on average every five (5) years;
- The pre-treatment tank and pumpwell must remain watertight. It is critical that surface water and groundwater be prevented from entering the tanks;
- The vegetation cover over the mound should be maintained on a regular basis with the clippings always removed from the surface of the mound;
- Possible cleaning out of the distribution pipework to prevent clogging.

Years of monitoring the performance of mound systems have shown that they can consistently and efficiently treat and dispose of domestic wastewater providing the mound has been sized, installed, operated and maintained correctly.

Secondary *Treatment Systems*

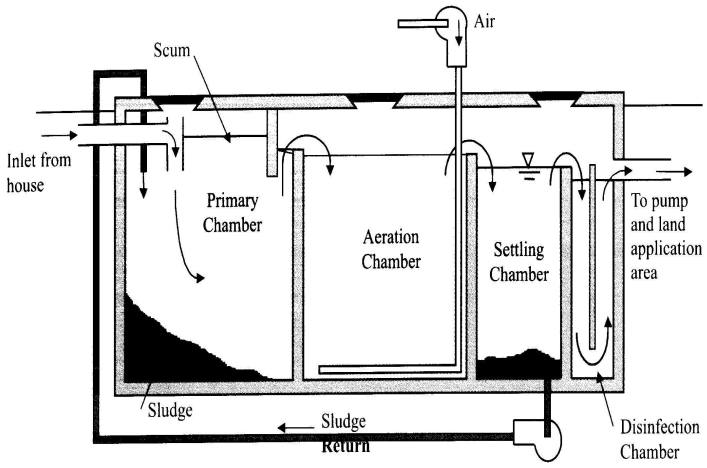
Aerated Wastewater Treatment Systems (AWTS)

What is an AWTS?

An AWTS is a purpose built system used for the treatment of sewage and liquid wastes from a single household or multiple dwellings. It consists of a series of treatment chambers combined with an irrigation system. The treated effluent from an AWTS is still high in nutrients such as nitrogen and phosphorus. If the disinfection system within the AWTS is not working efficiently or has run out of chlorine tablets then the effluent will contain high levels of micro-organisms – some potentially pathogenic. Both nutrients and microorganisms can have detrimental effects on the environment and the health of humans.

How does an AWTS work?

Wastewater from a household is treated in stages in several separate chambers. The first chamber is similar to a conventional septic tank. The wastewater enters the chamber where the solids settle to the bottom and are retained in the tank forming a sludge layer. Scum collects at the top, and the partially clarified wastewater flows into a second chamber. Here the wastewater is mixed with air to assist aerobic bacteria to further treat it. A third chamber allows additional clarification through the settling of solids, which are returned for further treatment to either the septic chamber (as shown) or to the aerated chamber. The clarified effluent is disinfected in another chamber (usually by chlorination or ultra violet light) before flowing into a holding well. When the level of effluent reaches a certain point, a float switch is activated and a submersible pump is used to irrigate the effluent to a land application area.



Advantages

- High quality effluent produced
- Treated and disinfected effluent can be re-used to irrigate lawns and gardens (subject to strict guidelines)
- Irrigation systems generally have a longer life than traditional absorption systems

Disadvantages

- High installation cost
- Requires large non recreational irrigation areas
- Relatively high energy requirements
- Relatively high maintenance requirements – mechanical components
- Affected by household chemicals

Council Requirements

The following minimum requirements apply to the AWTS and land application area:

- AWTS's need to be serviced quarterly by an approved contractor at a cost to the owner.
- AWTS's must be fitted with an alarm having visual and audible components to indicate mechanical and electrical equipment malfunctions. The alarm should provide a signal adjacent to the alarm and at a relevant position inside the house. The alarm should incorporate a warning lamp, which may only be reset by the service agent.
- The land application area must be of a size that provides sufficient treatment of the hydraulic loading and nutrients. The manufacturer, Council or consultant will calculate the area prior to installation.
- Warning signs must be displayed in the disposal area. A minimum of 2 warning signs must be displayed along the boundary of the disposal area with lettering that can be clearly read from a minimum distance of 3 metres. The wording must be to the effect – "Recycled water, Avoid contact, DO NOT DRINK".
- The irrigation lines are to be buried a minimum depth of 150mm and permanently established in the disposal area. If irrigation lines are run through fixed garden beds then the lines may be covered over with mulch (irrigation systems installed prior to May 2007).
- The irrigation pipe work and fittings must be designed for the irrigation of effluent. Garden hoses and garden fittings must not be used.
- Only approved sprinkler heads designed for the irrigation of effluent must be used. These produce a coarse droplet that rapidly falls to the ground and minimises travel by wind. Sprayers that produce fine aerosols must not be used for the spray irrigation of effluent (irrigation systems installed prior to May 2007).
- The disposal area must be a designated non-recreational area not used for recreational purposes.
- Diversion drains must be constructed up-slope of the disposal area to reduce run-on by stormwater. A 300mm compacted earth bund must be constructed down-slope of the disposal area to prevent effluent from escaping the disposal area.
- Irrigation systems installed after May 2007 shall be of a subsurface design.

Maintaining your AWTS

The effectiveness of the system will, in part, depend on how it is used and maintained. The following is a guide on good maintenance procedures that you should follow:

DO	DON'T
✓ Have your AWTS inspected and serviced four times per year by an approved contractor. Assessment should be applicable to the system design.	× Don't put bleaches, disinfectants, whiteners, nappy soakers and spot removers in large quantities into your AWTS via the sink, washing machine or toilet.
✓ Regularly maintain the irrigation area. Ensure that long grass and weeds are not permitted to prevent the sprayers from operating efficiently.	× Don't allow any foreign materials such as nappies, sanitary napkins, condoms and other hygiene products to enter the system.
✓ Regularly inspect the sprayers to ensure they are not blocked.	× Don't use more than the recommended amounts of detergents.
✓ Learn the location and layout of your AWTS and land application area.	× Don't put fats and oils down the drain and keep food waste out of your system.
✓ Keep a record of pumping, inspections, and other maintenance. This is a Council requirement.	× Don't switch off power to the AWTS, even if you are going on holidays.
✓ Use biodegradable liquid detergents such as concentrates with low sodium and phosphorous levels.	× Don't discharge the effluent into waterways, dams or drains.
✓ Conserve water.	× Don't allow livestock to graze or vehicles to drive over the irrigation area.

Warning signs to look out for

You can look out for a few warning signs that signal to you that there are troubles with your AWTS. Ensure that these problems are attended to immediately to protect your health and the environment.

Look out for the following warning signs.

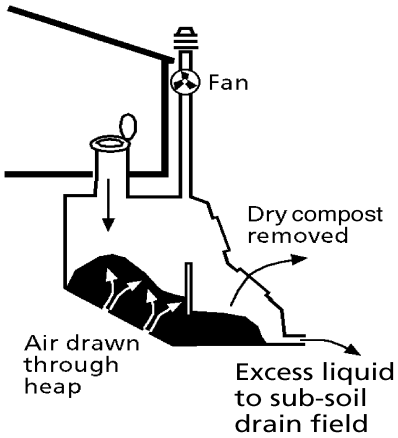
- Water that drains too slowly.
- Drain pipes that gurgle or make noises when air bubbles are forced back through the system.
- Sewage smells, this indicates a serious problem.
- Water backing up into your sink, which may indicate that, your system is already failing.
- Wastewater pooling over the land application area.
- Black coloured effluent in the aerated tank.
- Excess noise from the blower or pumping equipment.
- Poor vegetation growth in irrigated area.

Composting Toilets

There are two types of composting toilets available – waterless composting systems and wet composting systems. Waterless composters are used for the treatment of human excreta (blackwater) and any organic material from kitchens. As they are a waterless system a separate treatment system must be designed and installed to treat any liquid effluent (greywater).

How does a waterless composter work?

The blackwater from the dwelling is dropped directly down a chute or opening and collected in a large baffled chamber. There is no flushing mechanism therefore no water is used for the transfer process. In the collection chamber it is broken down by bacteria and moulds to a product called humus. The humus material must be aged for a set period of time before it is removed from the collection chamber and used. This time period depends on such factors as moisture level and temperature. A fan is used to remove odours from the chamber and to "draw" air through the pile to promote the growth of aerobic bacteria. Any excess liquid is collected in a pit at the base of the chamber and usually piped to a sub-surface disposal area.



Advantages

- Conserves water
- Reduces volume of solids
- Low running costs
- Handles shock loadings
- Recycles nutrients

Disadvantages

- High capital costs
- Requires separate greywater system
- May require a purpose built house to use
- Requires a commitment to composting principles
- Aesthetically unappealing to some people
- Compost must be removed periodically and buried below ground level

Council Requirements

The following minimum requirements apply to the waterless composting toilet and land application area:

- A permanent notice with basic instructions on suitable material to be composted and humus management must be affixed to the unit in a prominent position. This notice must include provision for recording the date of last deposit into each chamber and the last time humus material was removed.
- Humus material must be composted for the minimum composting period specified by the manufacturer in the maintenance manual.
- The humus must be raked and any heaps flattened on a regular basis to ensure even distribution of organic material breakdown. The unit should be monitored regularly for any blockages in the chute to ensure correct operation of the composting toilet system.
- The use of strong cleaning agents such as bleach or antibacterial cleaners must be minimised to assist in bacterial development. Any stored food scraps to be deposited must be kept in a container that prevents insect access.
- The occupier or an authorised service agent may remove composted humus from the humus closet, only after the minimum composting period as stated. The owner should ensure a working environment that meets OH&S requirements.
- Composted humus must only be removed through the access door (where provided) or from the humus storage tray.
- Composted humus must be managed within the boundaries of the premises and by the occupier of the premises. Written approval from Council is required if the composted humus is to be removed from the property.
- Once removed the composted humus should be buried under clean friable soil in a level area not subject to erosion at a depth of 75mm below finished ground level for a period of three months.
- The composted humus from the unit must not be placed directly in an area used for the production of root crops for human consumption.
- The composted humus may only be used in an area used for the production of root crops for human consumption where:
- The composted humus is removed from the humus closet as specified in 6, is placed into a separate lidded compost bin providing aeration, and a period of three months elapses without further addition to or removal from the bin, or
- The humus so managed has seasoned for a period of not less than three months and may be recovered and used.

Maintaining your Waterless Composting System

The effectiveness of the system will, in part, depend on how it is used and maintained. The following is a guide on good maintenance procedures that you should follow:

DO	DON'T
✓ Always clean the toilet lid by hand using a minimum of water and no harmful disinfectants.	× Don't put bleaches, disinfectants, whiteners, nappy soakers and spot removers in large quantities into the chamber.
✓ Keep a record of compost removal dates, inspections, and other maintenance. This is a Council requirement.	× Don't allow any foreign materials such as nappies, sanitary napkins, condoms and other hygiene products to enter the system.
✓ Learn the layout and operation of your system and any land application areas.	× Don't deposit the humus into inappropriate locations.
✓ Consult with a service provider if odour or vermin becomes excessive.	× Don't put excessive volumes of liquid into the composting chamber.
✓ Check odor, moisture and temperature regularly to detect how the system is.	

Pump-Out System

In some situations it is not possible to dispose of effluent appropriately within the property by standard land application methods. This may be because of the small size of the property or due to specific environmental constraints, such as proximity to waterways or high groundwater levels. In these circumstances the only means of dealing with the effluent is to use a pump-out system and completely remove the waste by tanker to a centralized treatment facility.

It should be noted that Council will only approve the installation of a pump-out system when it is evident that no other suitable means of treating and disposing of domestic waste is available

How does a pump-out system work?

The major components and workings are based on a normal septic tank. All the wastewater from a household enters the tank. Most of the solids settle to the bottom and are retained in the tank forming a sludge layer, whilst fats and greases collect at the top in a scum layer. Anaerobic bacteria in the septic tank break down the solid matter in the sludge and scum layers. Material that cannot be fully broken down gradually builds up in the tank and must be pumped out periodically. The liquid effluent overflows to a separate holding well and must be pumped out by an approved contractor on a frequency set by Council.

Council Requirements
The following minimum requirements apply to the installation of a pump-out system:

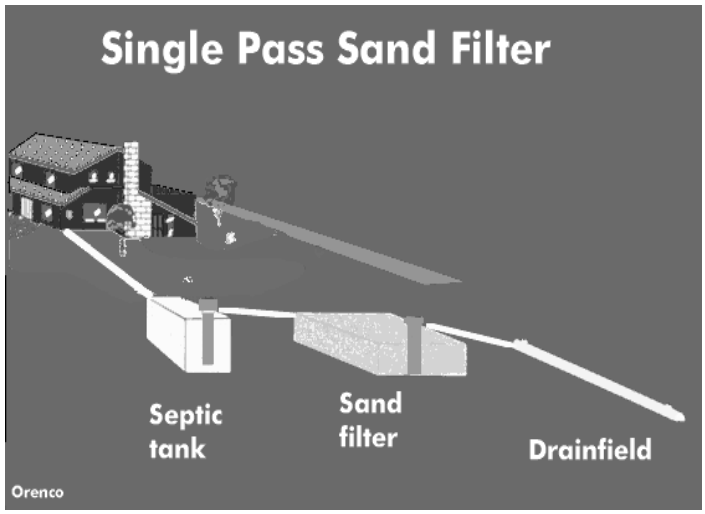
- The capacity (litres) of the holding well must be sized to allow for a seven-day storage. The minimum septic tank size is 3000 litres with a minimum holding well capacity of 5250 litres;
- The septic tank effluent holding well is to be emptied of effluent on a weekly basis or at such frequency that will permit safe and healthy operating conditions as approved by Council.
- The contents of the septic tank and effluent holding well are not permitted to overflow or be disposed of via any other method than removal to a Hunter Water Corporation sewage disposal point by a Council approved effluent removal contractor.
- An audible and visual alarm system is required to be fitted.

Ancillary Treatment Systems

There are a number of optional treatment systems available that can be used to provide a better quality effluent or allow disposal to more restrictive areas. It is important that expert advice be sought prior to committing to any specific purchase.

Media Filters

Media filters are available commercially through various manufacturers and if installed correctly can reduce the levels of nitrogen, organics, suspended solids and a range of pathogens. They are used in conjunction with treatment systems that provide primary or secondary levels of treatment. A media filter is usually constructed within a concrete or reinforced plastic container. The container is filled with a specific grade of sand. Effluent from the treatment device is pressure dosed through the media and if only a "single pass" filter, the effluent is then transported to the land application area for disposal. If the filter is of a "recirculating" type, then a certain portion of the treated effluent is returned to the dosing chamber for recirculation, whilst the remaining treated effluent is transported to the land application area for disposal. If properly constructed using the correct media grades, these devices work well, are low maintenance and last for many years. Media filters when used with active disinfection systems are excellent treatment systems suited to environmentally sensitive locations.



Sub Surface Flow Wetlands

Wetlands used for the purposes of treating effluent need to be constructed within an impermeable durable container. They are filled with a permeable media, usually gravel, and planted with specific wetland plants and reeds (*Phragmites australis*). Wastewater from the septic tank or treatment device passes through the permeable media and undergoes both filtering and treatment. Suspended solids, nitrogen and pathogens may be reduced by this means. At the end of the wetland is a collection well that collects the treated effluent for pumping or gravity feed to the land application disposal area. Maintenance is generally low, but harvesting of the plants may be required from time to time.

6. Saving Water and Reducing Nutrients

Everyone using an on-site wastewater treatment device and land application disposal method must consider the volumes of water and the types of products that they use. Remember, the water that you use in the house must be treated and disposed of within your property. Reducing water usage will lessen the likelihood of problems such as overloading your on-site treatment device. Overloading may result in wastewater backing up into your house, contamination of your yard with improperly treated effluent, and effluent from your system entering a nearby river, creek or dam.

Water reducing devices currently available on the market include:

- Dual flush toilets;
- Low flow shower roses;
- Front loading washing machines; and
- Volume restriction devices on internal taps.

Other ideas for reducing water include spreading the heavy water usage activities, such as laundry, over a longer period or the installation of a waterless composting toilet.

Nutrients, in particular nitrogen and phosphorus, can have detrimental environmental impacts. These can be reduced by:

- Use of low phosphorus detergents (refer appendix B);
- Use of low sodium detergents (refer appendix B) – sodium causes damage to soil structure;
- Use of alternate treatment devices such as composting toilets, AWTS, sand filters or wetlands.

Appendix A – Buffer Distance Requirements

When assessing a site for the installation of any type of On-site Sewage Management System the following buffer distances must be adhered to.

System Type/Land Application Method	Limiting Factor	Minimum Buffer Distances (metres)
All land application systems	Permanent surface waters such as: Lakes, rivers, creeks and streams	➢ 100 metres
	Domestic groundwater wells and bores.	➢ 250 metres
	Other waters such as: Farm dams, intermittent waterways and drainage channels.	➢ 40 metres
Surface Spray Irrigation (Standard Spray Heads)	Driveways and property boundaries.	➢ 6 metres if area up gradient ➢ 3 metres if area down gradient
	Dwellings and buildings	➢ 15 metres
	Paths and walkways	➢ 3 metres
	Swimming Pools	➢ 6 metres
Surface Spray Irrigation (Large Capacity Pop-Ups and Wobbler Sprays)	Dwellings and buildings	➢ 20 metres
	Property boundaries	➢ 10 metres
	Throw distance (radius)	➢ No greater than 5 metres
	Plume height	➢ No greater than 0.5 metres
Surface Drip and Trickle Irrigation	Dwellings and buildings, swimming pools, property boundaries and driveways	➢ 6 metres if area up gradient ➢ 3 metres if area down gradient
Subsurface Irrigation	Dwellings and buildings, swimming pools, property boundaries and driveways	➢ 6 metres if area up gradient ➢ 3 metres if area down gradient
Absorption System	Property Boundary	➢ 12 metres if area up gradient ➢ 6 metres if area down gradient
	Dwellings and Buildings, swimming pools and driveways	➢ 6 metres if area up gradient ➢ 3 metres if area down gradient

Appendix B - Laundry Products Guide - Sodium/Phosphorus (Courtesy of Lanfax Laboratories)

Phone Office/Lab (02) 6775 1157
Fax (02) 6775 1043
ABN: 72 212 385 096
email: lanfax.labs@science.com.au
Website: http://www.lanfaxlabs.com.au
493 Old Inverell Road
(P.O. Box W90) Armidale NSW 2350
Director: Dr Robert Patterson CPSS, CPAg, FIEAust
Soil Scientists and Environmental Engineers

Lanfax Laboratories

Proficiency tested with Aust. Soil & Plant Analysis Council

LAUNDRY PRODUCTS RESEARCH

The data, from which the graph on the reverse of this page was produced, were from research financed and undertaken by Lanfax Laboratories in July 1999, independent of any other organisation.

A range of laundry products was purchased from the local supermarkets comprising 20 liquid and 40 powder products. The selection covered the major brands, as determined from previous research, but included some lesser known brands, and five dishwashing detergents.

For each of the detergents, the mass of a 40 mL freshly poured sample was determined. Using the manufacturers' recommended loading rates for an average wash in a top loading automatic washing machine, an equivalent weight of each product was mixed with water from a rainwater system to represent the recommended dose of product with the full water load, that is, 160 litres of wash, rinse, deep rinse and spin cycle.

The samples were shaken for 1 hour at room temperature and the concentration of each of the elements of interest determined at the University of New England using an Inductively Coupled Plasma (ICP). Other chemical properties were measured by Lanfax Labs.

Only the sodium and phosphorus results are reported here. Other information from the research is available at our web site:

www.lanfaxlabs.com.au/publications.html

PATTERSON, R.A. (2000). *Water Quality Relationships with Reuse Options*. in 3rd International Symposium on Waste Water Reclamation, Recycling and Reuse. 3-5 July 2000. Paris France. International Water Association .Preprint Book 8, pp 205-212.

and

PATTERSON, R.A. (1999) *Reuse Initiatives Start in the Supermarket.* NSW Country Convention. Institution of Engineers Australia. 6-8 August 1999. Northern Group, Institution of Engineers Australia, Armidale.

How to read this graph:
For all on-site systems that apply the effluent by surface or subsurface application, the levels of sodium are critical. Choose the product with the lowest sodium. Levels over 20 g/wash are likely to be detrimental to plants and the soil.

The levels of phosphorus will depend upon the soil type and the use of the effluent. In some soils, phosphorus is not a real concern because it is immobile. In other soils it is likely to build up to high levels. It is preferable to choose the lower phosphorus values as well as the low sodium.

The detergents with long sodium bars (greater than 20 g/wash) should not be thrown out on your favourite garden as the sodium may be detrimental to the plants. High pH is also detrimental to plants and soils.

Figure 1. Ranking of laundry products according to sodium concentration with phosphorus concentration shown as tail. Ideal choice for on-site systems is one with a low sodium and a low phosphorus concentration.