

Environment & Health Protection Guidelines



On-site

Sewage

Management

for

Single

Households

ENVIRONMENT & HEALTH PROTECTION GUIDELINES

On-site Sewage Management for Single Households

January 1998



NSW HEALTH



**Department of Urban
Affairs and Planning**

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FOREWORD

Effective management of domestic sewage and wastewater is an important consideration for the health of communities and the environment. It requires the active involvement of many stakeholders, including NSW Government agencies, local councils, land developers, industry and householders.

These guidelines have been developed as part of a NSW Government commitment to a consistent and comprehensive approach to the use of small septic tanks and other on-site sewage management systems. The approach taken is based on the need to protect and enhance public health and the environment. On-site sewage management policies for single households have been developed, and information has been provided on how to implement them.

To help develop these guidelines a working group of Government agencies was formed, consisting of the NSW Department of Local Government, the NSW Environment Protection Authority, the NSW Department of Health, the NSW Department of Land and Water Conservation, and the NSW Department of Urban Affairs and Planning. A program of public consultation was also undertaken to ensure that all major environmental and health protection issues were considered.

Effective water cycle management is a critical factor for long-term sustainable use of land and other natural resources. These guidelines focus on on-site sewage management within the scope of local government responsibilities, and encourage each council to develop an on-site sewage management strategy for its own area that incorporates appropriate regional and catchment management objectives. A strategic approach to sewage management planning will facilitate the long-term sustainable use of residential land and will ensure that the cumulative and site-specific effects of wastewater are thoroughly assessed and managed.



While these guidelines aim to assist local councils in the regulation of small on-site sewage management systems, they also provide general guidance to other stakeholders such as developers and householders.

Implementing these guidelines will improve the environmental quality and health of those communities that rely on on-site sewage management.

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ABBREVIATIONS

AS	Australian Standard
AWTS	aerated wastewater treatment system
BA	building application
BOD	biochemical oxygen demand
CES	common effluent system
cfu	colony forming unit
DA	development application
DCP	development control plan
DLG	NSW Department of Local Government
DLWC	NSW Department of Land and Water Conservation
dS/m	deciSiemens per metre
DUAP	NSW Department of Urban Affairs and Planning
EC	electrical conductivity
EPA	NSW Environment Protection Authority
fc	faecal coliform
GIS	geographic information systems
HWSF	human waste storage facility
HWTD	human waste treatment device
LEP	local environmental plan
LES	local environmental study
LGA	local government area
LOP	local orders policy
NSW Health	NSW Department of Health
NWQMS	National Water Quality Management Strategy
on-site system	on-site sewage management system
OSMS	on-site sewage management strategy
RASFD	recirculating aerobic sand filter device
REP	regional environmental plan
SAR	sodium adsorption ratio
SS	suspended solids
SVI	sludge volume index
TN	total nitrogen
TP	total phosphorus
WC	water closet

INTRODUCTION

These guidelines have been developed to help local councils assess, regulate and manage the selection, design, installation, operation and maintenance of single household on-site sewage management systems. The guidelines may also be useful to householders, developers and others.

The guidelines aim to promote ecologically sustainable development, protection of the environment, protection of public health and protection of community amenity.

These guidelines address the environmental and public health performance requirements of on-site systems (including the on-site component of partial on-site systems). They also provide administrative and technical guidance on the steps that should be taken to ensure that on-site systems comply with these requirements in the long term.

The guidelines provide advice on: planning; site evaluation; system selection; system operation and maintenance; and ongoing system management, for on-site systems treating up to 2000 litres of wastewater a day.

The guidelines discuss:

- the range of on-site treatment systems available
- methods of applying treated wastewater to land.

The guidelines do not cover:

- costs of systems
- off-site management systems
- on-site sewage management systems for more than a single household or for commercial and industrial premises
- the separate management of greywater in a sewered area.

This document is a set of guidelines; it is not a design and operations manual. It provides guidance on possible ways to meet environmental and health outcomes.

The guidelines focus on new developments on land that has not previously been subdivided. However, they can also provide useful information when assessing other situations (including undeveloped land within previously subdivided areas) or when renewing existing systems. If an alternative approach or existing situation conflicts with these guidelines, options other than those outlined might be acceptable, providing that they meet the performance objectives described on page 16, and satisfy the requirements of all relevant statutory authorities.

ON-SITE SEWAGE MANAGEMENT OBJECTIVE

There has been increasing concern that on-site sewage management systems have failed to satisfy the expectations of unsewered communities in New South Wales. Growing evidence suggests that many of these systems do not meet environmental and public health requirements.

To enable public health and environment protection requirements to be met, land use planning for residential development needs to draw on the principles of ecologically sustainable development (ESD), total catchment management (TCM), water cycle management, and the protection of public health. If these principles are applied, the cumulative and incremental impacts of on-site sewage management can be assessed and mitigated.

These four principles have been considered in formulating the objective for these guidelines, which is:

to guide communities in New South Wales towards sustainable on-site management of domestic sewage and wastewater while protecting and enhancing the quality of public health and the environment in the long term

To help meet this objective, these guidelines encourage a systematic approach to land use planning, site assessment, and the selection, design and operation of on-site systems for sustainable management.

Local councils are encouraged to develop strategies for domestic sewage management as part of the Local Government Act management planning processes for council services and the Environmental Planning and Assessment Act planning processes for land use controls. Such strategies need to incorporate a management approach of continual improvement, addressing issues such as:

- incorporating sewage management considerations in the early stages of the environmental assessment and land use planning process
- considering all sewage management options
- the impact of on-site sewage management on a catchment or regional basis
- the commitment, responsibilities and education of a range of stakeholders, including local government, service providers, land developers and householders
- site-specific evaluation and assessment
- appropriate selection, design and construction of on-site sewage management facilities based on circumstances and site constraints
- ongoing maintenance and proper operation of installed systems
- initiation of a monitoring and review program.

The *Local Government Act 1993* and the *Environmental Planning and Assessment Act 1979* provide councils with the legislative framework needed to implement these strategies.

On-site sewage management systems and centralised sewerage systems should be compared on the basis of ecological sustainability and public health impacts, and the full range of benefits and constraints should be taken into account.

Centralised sewerage systems are usually the best method of sewage management in urban areas and in rural residential areas where a council water supply is available. This is because there is generally insufficient land to sustainably manage all the wastewater in these areas. Centralised systems are also the most suitable in regions with site constraints such as high rainfall, restrictive topography, or poor or shallow soils. Centralised systems can be built to service from less than 10 to many thousands of households. Ideally all wastewater, or that portion that cannot be safely diverted and re-used on site, is conveyed to a centralised facility, where it is treated to a level suitable for re-use or return to the environment in a sustainable manner.

On-site sewage management systems are more suitable in areas with few of the above site constraints and where there is sufficient available land to ensure systems can be operated in a sustainable manner. However, poorly planned and/or poorly maintained on-site sewage management systems can increase the potential for diffuse source pollution of waterways, groundwater and adjoining land, and can increase the risk of exposure to pathogens. Householders, service agents and local councils should take responsibility for monitoring performance and ensuring that pollution and health risks do not arise.

Consequently, on-site sewage management should not be seen as a cheap or easy alternative to a centralised sewerage system.

If on-site sewage management is determined to be the best long-term option for an area, appropriate development standards, including minimum lot sizes, should be established before the land is released. When setting the development standards, factors such as climate, soil, geography, environmental sensitivity, and risks to public health should be taken into account.



An EPA model has been developed for estimating land requirements for effluent irrigation, based on eliminating impacts on soils, waters, and public health (NSW Environment Protection Authority 1995). Assessments with the model in many areas of the State have shown that new subdivisions for residential development involving on-site sewage management require a minimum of 4000 - 5000 m² total area per household to reduce impacts in the medium to long term.

Site characteristics are key issues in planning subdivisions and choosing on-site sewage management systems. Appropriate levels of site assessment will be needed during the planning, system selection and system design stages. Information on site characteristics will be an important component of the decision making process, and because of this, site evaluation needs to be done by suitably qualified staff.

Finally, management of sewage on-site should not be seen as the simple disposal of an unwanted nuisance. Wastewater, including the nutrients and organic matter it contains, should be managed appropriately and used wherever possible.

SUPPORTING PRINCIPLES

On-site sewage management involves the treatment of wastewater followed by the release of liquid (treated wastewater) and solid (sludge, septage and compost) products into the environment. Inappropriate use or disposal of these products can have adverse impacts such as:

- the spread of disease by bacteria, viruses, parasites and other organisms in the wastewater
- contamination of groundwater and surface water
- degradation of soil and vegetation
- decreased community amenity, caused by odours, noise and insects.

Considerable effort has been made by the NSW Government to define how wastewater can be managed to ensure adequate and long-term environment and health protection. Although there are clear regional differences in how this may be achieved, there are principles for sewage management, the environment and health that underpin this process. The sewage management principles are:

1. Performance outcomes. We need to consider the wider environmental outcomes of sewage management decisions. Historically, the focus of sewage management has been on engineering design of sewerage systems and less consideration has been given to the environmental impacts caused by discharging wastewater to the environment. The realisation is that there is an increasing need to develop sewage management strategies that are consistent with other policy initiatives for protecting both land and water resources and public health, preferably on a catchment-wide basis.

2. Appropriate treatment. The level of sewage treatment required depends not only on the nature and sensitivity of the receiving environment, but also on the potential uses of the treated wastewater and biosolids.

3. Productive re-use of wastewater components. Many of the components of treated wastewater and biosolids can be used as valuable resources if managed wisely. These components include water, and nutrients such as nitrogen and phosphorus, which are in both treated wastewater and biosolids.

4. Reliability. It is inappropriate to install a sewage management facility and to expect it to perform adequately without proper supervision, maintenance and performance assessment.

5. Long-term impacts. It is inadequate to specify treatment systems, management practices, environmental monitoring or regulatory regimes that have short-term horizons. Degradation of the environment can be incremental or cumulative over time. The environmental and health principles underpinning the management of on-site systems include:

- ecologically sustainable development (ESD)
- water cycle management
- total catchment management (TCM)
- protection of public health and the prevention of public health risk.

The NSW Government supports the National Water Quality Management Strategy (NWQMS), which is a joint strategy of two Ministerial Councils: the Australian and New Zealand Environment and Conservation Council (ANZECC), and the Agricultural and Resource Management Council of Australia and New Zealand (ARMCANZ). The aim of the NWQMS is to pursue the sustainable use of the nation's water resources by protecting and enhancing their quality while maintaining economic and social development.

The NWQMS has identified key elements of a management approach for water quality. The policies and principles for managing diffuse source pollution particularly call for the adoption of best management practice. To implement best management practice effectively we need to use a range of policy instruments, including education, regulation and market-based measures. Strategies aimed mainly at changing practices can sometimes be indirect and imprecise, but managers need to have access to a range of instruments, and the flexibility to use them.

One of the main aims of these guidelines is to help local councils to address these environmental and health principles and programs through the development of effective management strategies. The main principles are discussed here to provide a working basis for developing performance objectives and to help those making decisions about on-site sewage management.

ECOLOGICALLY SUSTAINABLE DEVELOPMENT (ESD)

There are many definitions of ESD. The one below conveys the meaning as used in these guidelines, and is from the Australian National Strategy for Ecologically Sustainable Development (Commonwealth of Australia 1992). ESD is:

[development] using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future can be increased

In NSW, the following four principles of ESD are stated in the *Protection of the Environment (Administration) Act 1991* [Section (6)(2), (a)-(d)]:

- **the precautionary principle** - if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation
- **intergenerational equity** - the present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations
- **conservation of biological diversity and ecological integrity**
- **improved valuation and pricing of environmental resources**

The Local Government Act 1993 as amended by the Local Government Amendment (Ecologically Sustainable Development) Act 1997 requires that councils must have regard to the principles of ecologically sustainable development in carrying out responsibilities. A detailed definition of the 4 principles of ecologically sustainable development is provided in the Dictionary to the Local Government Act.

To achieve an ecologically sustainable approach, local councils need to build these four principles into all decisions about on-site sewage management.

WATER CYCLE MANAGEMENT

Water cycle management (sometimes called 'total water cycle management' or 'integrated water cycle management') is a comprehensive approach to managing water resources. It integrates all the natural and managed components of the water cycle into decision making.

Natural components of the water cycle include rainfall, rivers, oceans and groundwater, and the physical links between these, such as evapotranspiration, surface run-off and cloud movement.

Managed components of the water cycle include the supply of water for domestic, industrial, and agricultural purposes, and the treatment and release of sewage and stormwater.

On-site sewage management can potentially have an impact on the natural and managed parts of the water cycle through pollution of ground and surface waters with pathogens and nutrients. Any decisions about the on-site management of sewage should consider these impacts.

TOTAL CATCHMENT MANAGEMENT (TCM)

TCM (often simply called 'catchment management') involves the coordinated and sustainable use and integrated management of land, water, vegetation and other natural resources on a water catchment basis.

A basic element of total catchment management is the need for all 'stakeholders' within a catchment to participate actively. Local councils should work closely with catchment management committees, industry and the local community. Local councils should consider the implications of providing and managing wastewater services on a catchment-wide basis.

The publication *Incorporating the Principles of TCM into Land Use Planning* (DUAP - SCMCC, 1996) gives guidance to councils on how to carry out land use planning on a catchment basis.

PROTECTION OF PUBLIC HEALTH AND PREVENTION OF PUBLIC HEALTH RISK

Two major driving forces behind water management have had a significant impact on public health, as shown by the decrease in mortality and morbidity rates and corresponding increase in life expectancy this century. These two driving forces are:

- the provision of an adequate and safe public water supply through catchment management and protection, water treatment and disinfection, and distribution to each household
- the removal of human waste products using a reticulation and transfer system for separate sanitary management.

Because water is a precious resource that is having increasing population demands placed on it, the future trend is towards greater wastewater use and re-use. However, this must not be achieved at the expense of public health. It is essential that wastewater use and re-use is practised and managed wisely, with a view toward maintaining the public health standards expected by the community. Thorough, well-designed and rigorous management practices will help to minimise potential public health risks.

Local councils and community organisations need to understand the public health risk in the decisions made and options chosen for household on-site sewage management.

SUPPORTING POLICIES, STRATEGIES & GUIDELINES

These guidelines have not been developed in isolation. They are part of the Government's strategy for sewage management in NSW. Various additional reference documents may complement or be complemented by these guidelines. They include:

- the local council's own policies and guidelines for its particular area
- other government regulations, guidelines and policies (for example, State Environmental Planning Policies and NSW Health Certification Guidelines for human waste treatment devices)
- relevant technical references (see Bibliography)
- relevant Australian Standards (see Bibliography)
- the National Water Quality Management Strategy, published by the Australian and New Zealand Environment and Conservation Council (ANZECC 1992)
- various government initiatives, such as uniformity on plumbing and drainage regulation and the Country Towns Water, Sewerage and Drainage Program (DLWC 1996). (A program under which the NSW Government provides technical, management and financial support to local councils in country areas. It is administered by DLWC.)

PERFORMANCE OBJECTIVES

Performance objectives have been formulated to help make sure that on-site sewage management for single households is appropriate and will not affect public health or the environment. When considering using any on-site sewage management system, particular attention should be paid to the cumulative effects of multiple systems operating within a catchment, and within the wider environment.

On-site sewage management systems should meet the following environmental and health performance objectives over the long term:

- **prevention of public health risk** - sewage contains bacteria, viruses, parasites and other disease-causing organisms. Contact with effluent should be minimised or eliminated, particularly for children. Residuals, such as composted material, should be handled carefully. Treated sewage should not be used on edible crops that are consumed raw
- **protection of lands** - on-site sewage management systems should not cause deterioration of land and vegetation quality through soil structure degradation, salinisation, waterlogging, chemical contamination or soil erosion
- **protection of surface waters** - on-site sewage management systems should be selected, sited, designed, constructed, operated and maintained so that surface waters are not contaminated by any flow from treatment systems and land application areas (including effluent, rainfall run-off and contaminated groundwater flow)

- **protection of groundwaters** - on-site sewage management systems should be selected, sited, designed, constructed, operated and maintained so that groundwaters are not contaminated by any flow from treatment systems and land application areas
- **conservation and reuse of resources** - the resources in domestic wastewater (including nutrients, organic matter and water) should be identified and utilised as much as possible within the bounds posed by the other performance objectives; water conservation should be practiced and wastewater production should be minimised
- **protection of community amenity** - on-site sewage management systems should be selected, sited, designed, constructed, operated and maintained so that they do not unreasonably interfere with quality of life, and, where possible, so that they add to the local amenity - special consideration should be given to aesthetics, odour, dust, vectors and excessive noise.

USING THESE GUIDELINES

These guidelines consist of two major parts. Sections 1, 2, and 3, reflect a typical cyclical management model of continuous improvement, as illustrated in Figure 1. The factors and issues affecting on-site sewage management are defined, strategies and plans for on-site sewage management are developed and implemented, installed on-site sewage management systems are periodically monitored and the management strategy reviewed. The process may then be repeated using the information from the review to update and improve the management process wherever necessary.

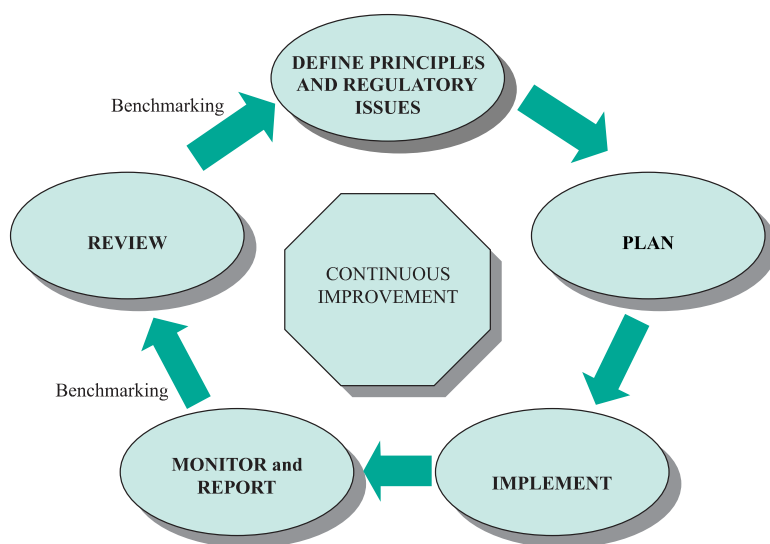


Figure 1: Management cycle of continuous improvement (adapted from DLWC 1997a)

Sections 4, 5, and 6, provide guidance on site evaluation, treatment and application systems, and the selection of an on-site sewage management system for a specific site. These sections will be updated from time to time as knowledge or issues change.