

DECENTRALIZED SYSTEMS FOR WASTEWATER MANAGEMENT AND SUSTAINABLE DEVELOPMENT

George Tchobanoglous
Department of Civil And Environmental Engineering. University of California at Davis, CA

Abstract

The orderly development of urban and near urban areas is dependent on the availability of water. In areas where the available sources of water are limited or are unreliable, it is now recognized that wastewater represents a very reliable water source. In the future, as the demand for fresh water exceeds the supply, and the value of water increases, the role and importance of water reuse will continue to expand. Decentralized wastewater management systems maintain both the solid and liquid fractions of the wastewater near their point of origin. In the future, as long-term strategies are developed to optimize the use of water resources and to protect the environment and sustain development, it is clear that decentralized systems will become an important element of those strategies.

The challenge will be to manage wastewater in a manner that will contribute to the maintenance of public health and a sustainable environment.

ON-SITE TREATMENT FOR SUSTAINABILITY

J (Hans) van Leeuwen,
Professor of Environmental Engineering, University of New England. Armidale

Abstract

No abstract available

DATABASES: CIVILISATION'S GREATEST RESOURCE OR RESOURCE USER?

Michael J. Brennan
Consultant Ecological Economist. Teroma Pty Ltd. Coffs Harbour

Abstract

This paper traces the changing status of knowledge-based databases from being a luxury good of the educated (usually the rich upper class) to the most marketed commodity in what is rapidly approaching the ideals of the perfect market. Commencing at the inception of knowledge-based databases this paper traces development from the time of the Pharaohs to the modern economic establishments, including all levels of government and corporate enterprises.

From this summary of historical development it is concluded that information storage and retrieval is the single largest user of natural and human resources (Land, Labour and Capital), but, also, is the greatest of our human resources (Investment). However, with the passing of pyramids, temples, paper and other historic recording media, innovative and dynamic digital approaches to data storage, retrieval and use are emerging with direct and immediate implications.

EVAPOTRANSPIRATION SYSTEMS FOR DOMESTIC WASTEWATER REUSE IN REMOTE ABORIGINAL COMMUNITIES

Martin Anda, Goen Ho & Christine Harris

Remote Area Developments Group, Inst. for Environ. Science, Murdoch University. WA

Abstract

In the past, sewage ponding in Aboriginal settlements was commonplace as a result of overcrowding combined with inappropriate septic tank and leach drain design, installation and operation. The response over the past 10 years has been to develop reticulated sewerage systems to lagoons when the funds become available. These are often successful in terms of operation, improved public health, and low-maintenance but are expensive and wasteful of limited water supplies. Evapotranspiration is an effective for on-site domestic effluent disposal in areas of Western Australia with soils of low permeability. Evapotranspiration systems have been established in a number of communities both for research/demonstration and as specified by architects. The systems usually follow two septic tanks for the disposal of all domestic effluent. A case study will be presented for a remote Aboriginal community with dry composting toilets and where the ET systems installed for greywater only have been monitored over the last two years since installation. This paper will report on the background to essential service delivery in remote Aboriginal communities, wastewater management generally in these locations, and the implications for environmental health conditions, before addressing specific issues of evapotranspiration system design and performance. The use of evapotranspiration has enabled reuse of effluent for successful examples of revegetation and food production and points to the need for a holistic approach to design and service delivery in these communities that includes a total environmental management plan.

Keywords

evapotranspiration, on-site, permaculture, reuse, revegetation, remote Aboriginal communities, wastewater.

ON-SITE SEWERAGE FACILITIES – WHAT IS EXPECTED OF NEW REGULATIONS

Peter D. Beavers

Department of Natural Resources, Queensland

Abstract

Queensland has revised its regulations covering on-site sewage treatment and land application of the effluent. It is proposed in this paper to critically look at these new regulations and compare them to the revised Australian Standard AS/NZS 1547. The new performance based regulations are completely different from the previous prescriptive based regulations. However, what is driving performance-based regulations and are they useful to the regulator? It is doubtful that a regulatory body has gone back and critically considered these two important questions. As all State regulatory bodies in Australia are introducing new regulations, it is timely that we review the aims and goals of the regulations and whether the anticipated outcomes can be achieved. It is probably a good time to ask if much thought was ever given to the expected outcomes. What is really required is a mechanism that allows the regulatory authority to be able to measure the success of new regulations. The need for prescriptive-based guidelines to accompany performance-based regulations is discussed. The information contained in this paper is based on the experiences encountered with the introduction of new regulations to Queensland.

Keywords

on-site, performance, performance standards, prescriptive standards, regulations, sewage

PERFORMANCE EVALUATION OF ON-SITE AERATED WASTEWATER TREATMENT SYSTEMS

Peter Beavers, Ian Tully and Anne Woolley
Department of Natural Resources, Queensland

Abstract

Several studies have been undertaken in Australia and the United States to evaluate the field performance of aerated wastewater treatment plants and sand filters. In this study, it was found that 32% of plants tested complied with the three approval criteria, ie. Biochemical Oxygen Demand (BOD), Suspended Solids (SS) and Thermotolerant Coliforms (TC), 42% complied with BOD and SS, and 69% with TC alone. Inadequate or improper maintenance was identified as a main contributor to poor performance. The most common mechanical problem was the failure of the chlorination system through jamming of the tablets in the dispenser. The basic design of an AWTS system provides no barrier to excess suspended solids carryover from chamber to chamber. High-suspended solids concentrations in the final effluent were a common occurrence. Effluent from well-maintained systems generally complied with standards. Based on the results of this study, potential design modifications, improved maintenance procedures and monitoring parameters are suggested.

Keywords

aerated, biochemical oxygen demand, disinfection, performance, suspended solids, thermotolerant coliforms, treatment, wastewater

THE ECOMAX ON-SITE SEWAGE TREATMENT SYSTEM

Max Bell
Director, Tech-Treat Pty Ltd

Abstract

The Ecomax system is an innovative technology which treats sewage to a high quality. As the system is passive it requires no power or mechanical maintenance.

The technology, which is referred to here by the Registered Trade Name "ECOMAX" was developed by Ecomax Waste Management Systems Pty Ltd (EWMS), a Perth based developer and supplier of wastewater treatment technology specializing in nutrient removal systems. The EWMS system is based on a patented effluent flow and treatment process developed by the company and proven in sewage treatment since the early 1990's.

Ecomax technology was originally applied to residential dwellings in Perth and surrounding areas where primary treated effluent, containing high nutrient levels was entering the water table of the sand stratum and creating environmental damage to downstream waterways. By high quality, low nutrient content treatment, the effluent entering the water table from an Ecomax system was of much less impact.

Further testing of the technology, at sites in the Blue Mountains of NSW, showed reliable and highly favourable results in that environment, and encouraged Tech-Treat Pty Ltd, as agent for EWMS, to apply the technology to other areas.

Current guidelines for on-site sewage treatment and effluent dispersal systems require that much greater consideration be given to irrigation areas and wet weather storage capacity than in the past.

The result of this impetus has been to bring Ecomax to an economically competitive level with other on-site systems, particularly in restrictive and / or environmentally sensitive areas.

Keywords

absorption, ANZECC, Ecomax, evapotranspiration, water balance, Wisconsin mound

THE 'FILTER' TECHNIQUE FOR YEAR ROUND TREATMENT OF WASTEWATER

T.K. Biswas, N. S. Jayawardane, J. Blackwell, E.W. Christen and F.J. Cook²

CSIRO Land and Water, Griffith, NSW 2680. ²CSIRO Land and Water, Indooroopilly, QLD 4075

Abstract

Existing systems for land treatment of wastewater using cropping and forestry are often less economical than treatment plants. This is mainly due to the need for expensive winter and wet weather storage, when crop irrigation requirements are low. Further, conventional land application of wastewater on soils with restricted internal drainage, which occur extensively around urban areas in S.E.Australia, often leads to waterlogging and salinisation.

In order to overcome problems associated with traditional wastewater disposal schemes, the FILTER (Filtration and Irrigated Cropping for Land Treatment and Effluent Reuse) technique was developed at CSIRO, Griffith. FILTER combines the use of nutrient-rich wastewater for intensive cropping with filtration through the soil to a subsurface drainage system. This technique is also capable of handling high volumes of wastewater during the periods of low cropping activity or periods of high rainfall. Wastewater application and subsurface drainage in the FILTER system are regulated to ensure adequate removal of pollutants, thereby producing minimum-pollutant drainage water which meets NSW Environment Protection Authority (EPA) criteria for discharge to surface water bodies throughout the year.

In this paper we describe the field evaluation of the FILTER technique at the Griffith City Council Sewage works site. The trial was designed and operated as one of eight irrigation blocks of a proposed 120 ha commercial FILTER system, required for around-the-year treatment of all Griffith's sewage wastewater. The field data from the winter cropping season of 1998 including hydraulic flows and removal of pollutants such as nitrogen, phosphorus, BOD, suspended solids, oil and grease, chlorophyll-a, and *E.coli* are discussed. Results indicate that a well managed FILTER technique can reduce pollutant levels in drainage waters below NSW EPA limits, while maintaining adequate hydraulic flow, crop yields and nutrient removal to potentially make it a sustainable system.

The potential for development of a MINIFILTER system to provide environmentally acceptable on-site treatment and disposal of domestic wastewater and greywater is also discussed.

Keywords

wastewater treatment, pollutant removal, hydraulic properties, controlled subsurface drainage.

FLOWFORMS AND PONDS IN ON-SITE WASTEWATER TREATMENT

Paula Brown* and Leigh Davison

School of Resource Science and Management, Southern Cross University, Lismore, 2480

*current location: Marine Habitat Program , Primary Industry & Resources South Australia

Abstract

Flowform cascades channel a downward-flowing stream of water in a pulsating figure-of-eight pathway. It has been suggested by flowform designers that passage through this flow path enhances the life-supporting properties of water. Flowforms were designed for and are commonly utilised as water features in artistic and aesthetic applications. Flowforms have also been utilised in a limited number of experimental on-site and cluster wastewater treatment systems since the 1970s. Recent years have seen a growing interest in their potential for use in a range of wastewater quality improvement applications including aeration, BOD reduction and disinfection. However, little or no work has been undertaken to date to quantify the effect of flowforms on DO, BOD and pathogen indicators. This paper describes a study on the effect of two flowform cascades on the quality of a number of effluent types. It was found that the flowforms increased the DO concentrations in low (roughly 10 mg/L) and medium (roughly 100 mg/L) BOD effluents, thus confirming reports of their suitability for reducing waste stabilisation pond odour. In the “near laboratory” conditions of this study, no significant reductions in BOD or faecal coliform concentrations were observed. It is suggested that further studies could examine the effect of flowforms on the disinfective power of established pond / flowform wastewater treatment systems.

Keywords

aeration, BOD reduction, disinfection, flowform, odour reduction, on-site, pond, wastewater treatment

THE BENEFITS OF INDOOR WATER EFFICIENCY FOR ON-SITE SYSTEM PERFORMANCE.

Anna Carew ¹, David Robinson ², Stuart White ¹

¹ Institute for Sustainable Futures, ² Environmental Protection Authority

Abstract

The most common sewage treatment technology in unsewered parts of Australia is the septic system (septic tanks with absorption field effluent disposal). A combination of inappropriate design, poor management and inadequate planning controls has resulted in these systems manifesting high failure rates. Septic system failure is widespread in NSW, with many systems failing to meet chemical and microbiological standards for effluent discharge.

Reducing hydraulic loads to septic systems has the potential to alleviate or reduce the magnitude of system failures; or to extend the effective system life allowing time for alternative sanitation options to be explored. This paper reports on a water end-use analysis undertaken in the unsewered village of Clunes, New South Wales, Australia and draws conclusions about indoor water use. End-use analysis indicated that residential water efficiency could result in sizeable reductions in hydraulic load to septic systems. The potential for extending the effective life of absorption trenches through water efficiency is discussed, along with other financial benefits to householders. There are major opportunities for implementing water efficiency in the village and potential for significant septic system performance improvement through water efficiency.

Keywords

indoor water efficiency; greywater reuse, hydraulic load; septic systems; water consumption modelling; water end use analysis;

TrenchTM 3.0 - A COMPUTER APPLICATION FOR SITE ASSESSMENT AND SYSTEM SIZING

Bill Cromer

Senior Consultant, Environmental & Technical Services Pty. Ltd., Hobart

Abstract

A computer application has been developed to aid in the assessment of sites for wastewater management. TrenchTM 3.0 supports all Australian guidelines and standards. Within the Windows environment, it uses buttons and menus to assess a comprehensive set of site and environmental factors, review and edit the limitations of each factor for wastewater disposal, select an appropriate disposal and treatment method, and apply a water balance or nutrient balance approach to help size trench dimensions or irrigation and effluent re-use areas.

Keywords

absorption trenches, computer application, environmental sensitivity, irrigation and effluent re-use areas, site assessment, site capability, system sizing, wastewater,

A CRITICAL LOOK AT CURRENT GUIDELINES FOR EFFLUENT DISPOSAL: A PRACTISING SOIL SCIENTIST'S PERSPECTIVE

Rob Cumming

Principal Soil Scientist. Reme Pty Ltd. Goulburn, NSW.

Abstract

This paper examines the requirements for effluent disposal and discusses these together with the need for accurate parameters for assessment of individual sites and the impact of Government Guidelines.

Keywords

Assessment, disposal system, effluent, impact, soil, parameters

COMPOSTING TOILET WITH REED BED GREYWATER TREATMENT: TWO SYSTEMS

Leigh Davison* and Phillip Wallace**

* School of Resource Science and Management, Southern Cross University, Lismore.

** Smith & Wallace Engineers, Byron Bay.

Abstract

Domestic on-site systems based on composting toilets and greywater treatment by reed bed are becoming an increasingly popular option on the NSW far north coast. This paper describes two such systems and briefly discusses their performance in terms of water quality outcomes, effect on disposal area requirement and level of management. It is concluded that, because both technologies reduce hydraulic and pollutant loadings, they lead to improved effluent quality and lower disposal area requirement. This is particularly important in environmentally sensitive locations or where there is limited availability of suitable disposal area. The level of management required appears to pose no problems for current users of these systems. The use of greywater primary treatment devices such as grease/sediment traps and gravel filters as alternatives to the septic tank is discussed. It is suggested

that there may be some merit in a management approach that involves do-it-yourself, relatively frequent operations involving little or no equipment, and comparatively innocuous wastes. Further monitoring of these systems, as their use becomes more widespread, should throw more light on the costs and benefits of including these treatment elements in on-site systems.

Keywords:

composting toilet, constructed wetland, gravel filter, grease trap, greywater, on-site system, reed bed, sediment trap.

WHAT LEVEL OF MAINTENANCE FOR ON-SITE DOMESTIC WASTEWATER SYSTEMS?

Brian Devine

Health Department of Western Australia

Abstract

Septic tank systems are the most common type of on-site wastewater system used where sewerage services are not available. Maintenance of the septic tank system is essential to ensure the integrity of the system, its long term use, thereby minimising opportunities for failure. Failing septic tank systems do cause public health and environmental concerns. An effective monitoring and maintenance program is necessary and must be supported by legislation. A regular inspection system, together with the development of operation and maintenance guidelines, will assist the property owner with the management of their system. Councils will need to introduce a licensing and management system, undertake community education and support the training of personnel involved with monitoring and inspection.

Keywords

aerated wastewater treatment systems, inspection, maintenance, septic tank,

MUNICIPAL ON-SITE WASTEWATER MANAGEMENT PLANNING - CASE HISTORIES IN NEW ENGLAND (USA)

Bruce F. Douglas

Senior Geoscientist, Stone Environmental, Inc., Montpelier, Vermont, USA

Abstract

In the northeastern corner of the United States of America (USA) are three New England towns that have selected different levels of management for on-site soil absorption systems in their communities. The common aspects of the projects have been extensive use of community involvement, databases and Geographical Information Systems (GIS) to inventory and manage on-site systems on a community-wide and potential problem area basis.

Jericho, Vermont, USA is an inland suburban/rural town with 5,000 residents located in the foothills of the Green Mountains of northwestern Vermont. The town began their soil absorption system management with an integrated wastewater needs assessment in current and historic growth areas. Ten

years of permit data and parcel mapping enabled the town to clearly evaluate the conditions for on-site systems in the community. The soil suitability for on-site systems based on Natural Resources Conservation Service soils mapping and the environmental sensitivity of groundwater and surface waters was evaluated. The locations of failed on-site systems were compared to the soil suitability and environmental sensitivity to determine the appropriateness of on-site systems in Jericho.

Duxbury, Massachusetts, USA is a coastal community with approximately 14,000 residents and 6,000 soil absorption systems. The town developed a Community Septic Management Plan to manage these on-site systems with the following components:

1. A database to keep track of site evaluation, permitting, installation, maintenance, repairs and complaints regarding each on-site system;
2. An in-house GIS system to utilize existing parcel mapping and other digital data available from the state and other agencies;
3. Identification and prioritization of environmentally sensitive areas for ranking applicants to a low-interest loan program to finance repairs of failed systems;
4. A public outreach/education program to inform residents about their soil absorption systems and the community management program,
5. A loan program for residents to finance upgrades of failed on-site systems.

Tisbury, Massachusetts, USA is an island community with approximately 3,000 year-round residents, 10,000 summer visitors, and 2,400 on-site septic systems. The town is taking a very pro-active approach to on-site system management. The local Board of Health and Wastewater Planning Committee is developing a management program with required inspections for every system and requiring pump-outs of septic tanks based on expected rates of solids accumulation for the specific tank size and system usage. GIS has been used to delineate environmentally sensitive areas and parcels; a ground water flow model has been used to determine water table contribution to surface waters; and a database is being developed to track the management program and notify residents of compliance requirements. This approach enables the residents to easily see the relationship between the areas that utilized on-site systems and environmentally sensitive areas such as aquifers, streams, coastal ponds and wetlands using a risk-based management strategy.

Keywords

databases, Geographic Information Systems, Local Government, management, on-site systems

ON-SITE SEWAGE MANAGEMENT IN FEDERAL

Peter Dupen

Aztex Environmental Pty Ltd. Byron Bay. NSW

Abstract

Federal is a small but rapidly growing village in the hinterland of Byron Shire. Aztec Environmental recently completed a study on the local current on-site wastewater management practices, and on what impacts these practices are having on the local waterways. The implications of the new State Guidelines (1998) were considered in relation to the Federal case study, and the outcomes of our modelling will be important in determining how Council will approach wastewater regulation in similar parts of the Shire.

The study incorporated surveys of householders and service providers, detailed site inspections of all available systems, soil sampling and a GIS-based landform assessment to provide a final “land suitability map” for the study area.

The principal outcomes of the study are that most on-site sewage is being poorly managed in Federal, with 90% using septic tanks and small trenches as the management technique. However, the deep, well-structured krasnozems developed over the local basalt lava flows are well suited to effluent disposal (and incidental tertiary treatment), which appears to be the main reason that local waterways are not grossly polluted, at least in dry weather.

Byron Shire receives more rainfall than it loses in evapotranspiration. Applying the Federal conditions determined in this study to the State Guideline methodologies leads to impractical requirements for application areas and storage facilities. These requirements are considered unnecessary, implausible and could lead to serious health and environmental risks if implemented. Aztec Environmental's preference is to treat the effluent to a high enough standard that occasional surcharges to surface or groundwaters will not cause adverse impacts.

Keywords

field study, On-site, sewage, water pollution, wastewater

ON-SITE SYSTEMS AND CATCHMENT MANAGEMENT

P.M. Geary¹, G. Robertson² & J.H. Whitehead³

¹ The University of Newcastle, NSW, ² Sorell Council, Tasmania,

³ Whitehead and Associates Environmental Consultants, NSW.

Abstract

In 1998 a three-stage catchment management and groundwater monitoring program commenced in several small unserviced communities in and around Dodges Ferry, approximately 35 km south east of Hobart, Tasmania. Domestic wastewater disposal in these communities (where lot sizes are typically less than 800 m²) is on-site where the absorption systems are in sandy soils. Sorell Council commenced the program because of the potential for ground and surface water contamination and the increase in the density of the systems associated with development. The area is along the coastal zone and is commonly used for primary contact recreational activities such as swimming and surfing, particularly in the summer months.

In this paper, part of the catchment management program and project methodology is discussed and the results from the groundwater monitoring program are presented. The initial survey results revealed low levels of bacterial indicators in bore water. However, some high nitrate concentrations were recorded, usually associated with clusters of houses and, from this, several high-risk areas could be identified. It does appear as though the failure of on-site systems is affecting, to a limited degree, the quality of shallow groundwater in the area.

In 1988 the first Code of Practice: *Site Assessment for Septic Tank Absorption Trenches* (AIEH, 1988) was developed in Tasmania by the Australian Institute of Environmental Health (AIEH) for use by all professionals making decisions on site suitability for septic tank systems. In 1996 the Tasmanian Division of the Institute resolved to update the Code and a draft, *Site Assessment and System Design for Disposal of Wastewater from Septic Tanks and Sullage Water* (AIEH, 1998) was released for comment in December 1998. This development coincides with other major State based revisions to guidelines and the finalisation of Australian Standard 1547 (Standards Australia / Standards New Zealand, 1999). The introduction of the new codes will result in amendments to planning and development guidelines that will ensure that new on-site systems perform satisfactorily.

Keywords

Groundwater, contamination, septic systems, nitrate, bacteria.

THE HYBRID TOILET SYSTEM; GENERAL PRINCIPLES AND SYSTEM DESIGN DRIVERS

Ian Gough¹, Mark Langford² & Andrew Gough.¹

¹ Gough Plastics; ²Townsville City Council

Abstract

In October 1996, James Cook University, Townsville City Council, Port Moresby City Council, Sustainable Wastewater Technologies and Gough Plastics set out to produce a toilet system ideally suited to the environment of the Asia Pacific Region.

The toilet systems that were evaluated were those in use in many countries. The most common system found was variations of the septic tank system. The authors discussed at length the advantages and disadvantages of composting systems. The conclusion was there was currently no composting system available that was a viable long term alternative. The team then set about utilising the best of all the waste treatment technologies available, in both large and small scale capacities.

In simplistic terms, the Hybrid Toilet System (HTS) consists of a non-flushing drop toilet feeding directly into a septic tank filled with water, which then delivers, via displacement, clarified effluent to the secondary treatment unit. On completion of treatment the effluent is then dispersed to ground via a gravel bed. This paper outlines the processes and construction of the HTS.

TRAINING FOR ON-SITE WASTEWATER MANAGEMENT

Ian Gunn

Dept of Civil and Resource Engineering, The University of Auckland, NZ

Abstract

The current move from a prescriptive to a performance approach to designing, installing, and operating on-site systems has given focus to the need for training programmes for all participants in the implementation and use of on-site systems. The new AS/NZS 1547 on-site wastewater management standard envisages specific training for the several professional groups involved in on-site practice. Such training will only become a reality if required by regulatory authorities. In the US training has focused on the development of “training centers” complete with demonstration units displaying on-site treatment and land application hardware and fittings as teaching accessories. Australia has a well received and regular training course delivered through the Centre for Environmental Training in NSW by a group of professional specialists in on-site wastewater design and research. New Zealand’s approach is currently ad hoc, with a range of seminar, workshop and inspection training exercises taking place on demand. In addition, two newsletters, “On-Site NewZ” in NZ and “NOSSIG News” in Australia, provide information flow between professionals. The variety of training models used in practice indicate that training has evolved to respond to specific national, regional and local circumstances. The future challenge for on-site training is to deliver educational programmes that ensure environmentally sustainable on-site wastewater servicing is achieved via well informed practitioners.

Keywords

education, on-site wastewater, septic tank systems, training, wastewater management.

PROCESS ANALYSIS AND DESIGN OF ON-SITE AERATED WASTEWATER TREATMENT SYSTEMS

P. Hagare ¹ and H.B. Dharmappa ²

¹ Lecturer, Environmental Engg. Group, University of Technology, Sydney

² Senior Lecturer, Dept. of Civil, Mining & Environmental Engg. University of Wollongong

Abstract

The collection, treatment and disposal of wastewater from single households by the use of on-site waste management systems is a prevalent feature in unsewered regions of Australia. Although simple systems such as septic tanks with trenching fields are still in use, increased environmental awareness has led to changes in the type of systems that are currently installed for on-site waste management. This paper deals mainly with one such system, i.e., the aerated wastewater treatment system (AWTS). In an AWTS, wastewater from a septic tank is further treated by bacterial populations which thrive on oxygen. The types of AWTS available today are varied and can be categorised depending on how microorganisms are retained within the aeration tank. These categories are suspended growth, attached growth and hybrid systems. In a hybrid AWTS, microbial population, growing both in suspension as well on a fixed medium, is used for treating the wastewater. One of the aims of this paper is to describe and analyse various processes in an AWTS. The main emphasis of this paper however, is to present an analysis of the evaluation of parameters required for the design of the biological treatment in a hybrid AWTS. The evaluation showed that both hydraulic retention time (a design parameter of suspended growth systems), organic loading rate (of attached growth systems) and solids retention time (an operational parameter of suspended growth systems) play important roles in designing a hybrid on-site AWTS. The field data from the existing on-site systems is a rich source of performance information. These should be collected and analysed before setting up specific design criteria and standards for on-site hybrid AWTS.

Keywords

Aerated wastewater treatment systems, attached growth, disinfection, design parameters, hydraulic retention time, on-site, organic loading rate, solids retention time, suspended growth hybrid systems,

EXPERIENCES OF ON-SITE WASTEWATER TREATMENT IN INDONESIA.

Christine Harris, Kuruvilla Mathew & Goen Ho.

Remote Area Developments Group, Inst. Environ. Science, Murdoch University. WA

Abstract

The lower capital cost and decreased disturbance when installing on-site treatment systems, compared to extensive sewerage systems makes on-site treatment a more viable form of sewage treatment for developing countries. However there are still problems associated with implementing sustainable on-site wastewater treatment systems in developing countries. This paper highlights some of those problems and offers some solutions.

A demonstration project, involving the installation of two on-site wastewater treatment systems in Indonesia, was studied. Problems encountered during installation of the systems are discussed along with possible solutions. Other on-site wastewater treatment systems in Indonesia were also studied. By collating the knowledge gained from these studies a number of guidelines have been developed that should be addressed, in order to make on-site wastewater treatment systems work in developing countries. These guidelines are -

- (i) A simple system has more chance of working.
- (ii) Materials should be obtainable locally.

- (iii) Systems need to be designed specifically for the situation, no one system taken 'off the shelf' will work in every situation.
- (iv) The greater the extent of local involvement in planning and installation of an on-site system the more likely it is to be successful and sustainable.
- (v) Allowances for ongoing operation and maintenance costs need to be integrated in the project.
- (vi) Indigenous technologies and local innovations should be taken into account when designing systems.
- (vii) Reuse of treated wastewater and faeces should be a major consideration in designing and selecting treatment technologies.

Keywords

community participation, developing countries; domestic wastewater treatment; indigenous technologies; local knowledge; project guidelines.

ON-SITE TREATMENT BY REED BED AND POND: A STUDY OF TWO SYSTEMS

Thomas Headley and Leigh Davison

School of Resource Science and Management, Southern Cross University, Lismore

Abstract

This paper describes a study which examined the effect of season, system maturity and peak loading on two septic tank / reed bed / pond systems, each treating effluent from a 250 student school. One system was eight years old, the other was newly commissioned. Both reed beds were found to be effective in treating biochemical oxygen demand, suspended solids and total nitrogen. The newer reed bed underwent an adaptation period of about six months before approaching the treatment levels of the mature one. There appeared to be no seasonal effect on the level of treatment. A one-day doubling of load on one of the systems produced minimal change in the quality of pond water, thus demonstrating its robustness under peak loadings. One of the ponds was found to achieve a substantial total nitrogen reduction while experiencing an increase in suspended solids through algae growth. A summertime water balance showed that 40% of the hydraulic loading was being evapotranspired. It was concluded that the inclusion of reed bed / pond elements in on-site systems has several beneficial effects, including smaller and more sustainable disposal areas. It is suggested that the use of ponds and other nitrogen reducing technologies becomes more feasible when treatment is provided on a cluster rather than an individual basis.

Keywords:

cluster scale systems, on-site wastewater management; peak loading; ponds; reed beds; seasonal variation; system maturity;

REUSE OF SEPTIC TANK EFFLUENT USING A SYSTEM CAPABLE OF A C.E.D. SCHEME

Noel Hodges

Water & Sewerage Engineer, Beaudesert Shire Council. Qld.

Abstract

The safe reuse of household wastewater for garden watering is highly desirable, particularly as the potable water supply in Australia is limited and 40-50% is used on household gardens. Soil importation overcomes many of the problems which occur in on-site wastewater disposal areas from soils with poor drainage capacity. Effluent reuse through evapotranspiration rather than on-site soil

absorption eliminates most of the concerns about contamination of groundwater and waterways. A low maintenance septic tank design has been developed to achieve the safe reuse of effluent using evapotranspiration. This system is based on maintaining aerobic soil conditions in mounded garden beds to maximise natural processes in the treatment and reuse of effluent. Intermittent dosing with effluent every sixth day on parts of the garden bed mounds is achieved with an automatic valve system. Intermittent irrigation is incorporated into this system to provide a long delay between soil saturations so that a large number of plants, including native species, can be used in the garden bed vegetation.

Initial experimentation has been carried out on the irrigation concept with different plant species to assess the effectiveness of the system. The results of this experimentation, the septic tank design and the intermittent irrigation system are detailed.

This concept also has a significant advantage over other on-site systems in that it provides the core facilities for a future common effluent drainage scheme, if required. This system provides for major cost savings (approx. 80%) in the collection, treatment and decentralised sewage treatment for groups of 30-200 households for all or part of each household's on-site septic tank effluent. This design enables both on-site garden bed irrigation and off-site sewage treatment to be achieved at the same time. Details of these cost savings are explained.

Keywords

aerobic soil treatment, common effluent drainage, decentralised, evapotranspiration, garden bed mounds, sewage treatment, intermittent irrigation, septic tank, wastewater reuse,

NEW SOUTH WALES ON-SITE SEWAGE MANAGEMENT REFORMS

Robert Irvine, Helen Hillier & Lenore Fraser

Policy & Research Branch, New South Wales Department of Local Government

Abstract

In March 1998, the NSW Minister for Local Government announced a package of local government regulatory reforms and guidelines to enable more effective council regulation and performance supervision of decentralised sewage management systems. The *Local Government (Approvals) Regulation 1993* as amended by the *Local Government (Approvals) Amendment (Sewage Management) Regulation 1998*, specifies performance standards for sewage management and requires council approval for the ongoing operation as well as the initial installation of *a system of sewage management* (as defined). Guidelines to assist councils to develop decentralised sewage management systems (prepared in consultation with the NSW Environment Protection Authority, the NSW Department of Land and Water Conservation and NSW Health) were published by the Department of Local Government in 1998. Financial assistance of up to \$3.8 million over two years is being provided to assist councils to register individual sewage systems, to develop decentralised sewage management strategies and to develop risk based sewage pollution action plans for sensitive areas.

The On-site Sewage Management (OSM) program involves a two-tier approach with financial assistance for OSM strategy projects to identify, and develop supervision strategies for on-site sewage systems in all council areas, and OSM enhancement projects for more comprehensive sewage pollution action plans in sensitive coastal catchments. Assistance will also be provided to develop research, education, data-management and training projects.

This paper describes the NSW sewage management reforms and the process for implementation of the On-site Sewage Management Program.

Keywords:

decentralised sewage management, sanitation, septic systems, water quality.

DEVELOPMENTS IN DETERMINING CRITICAL LOT DENSITY FOR THE PROTECTION OF WATER QUALITY

Peter A Jelliffe

Principal, Jelliffe Environmental Pty Ltd. Coffs Harbour

Abstract

This paper is divided into two parts. The first part examines methods for determining lot density in unsewered areas. The second part examines the issue of distribution of unsewered development in sensitive catchments.

One factor in determining appropriate minimum lot size for unsewered areas is the potential for pollutants associated with sewage effluent to escape from the lot and enter the stormwater system, or groundwater, causing pollution. Methods for determining minimum lot size (critical lot density) have to date involved either estimating the minimum area required for site soils to remove or retain pollutants, or estimating the mass of pollutant surcharging from failing disposal systems; the critical lot density is then determined by ensuring the mass of pollutant escaping from the development site does not exceed a pre-determined limit based on environmental values for the receiving water. The assimilative capability of a site is related to processes which occur in the ground (permeability, plant uptake, P sorption, NH₃ volatilisation etc). The impact of surcharging is related to system failure rates and processes associated with overland flow. The paper examines important factors relating to each of these two pollutant export routes and provides argument to show that the contribution of pollutants moving through the ground may be negligible when the area between the disposal field and a sensitive watercourse exceeds the “minimum assimilative buffer area” for the site. The “minimum assimilative buffer area” is a function of a number of factors including: soil characteristics; plant uptake capacity; climate; slope; and the pollutant loading. The limiting factor is often the area required for the uptake of nitrogen by plants.

The second part of the paper looks at the export of pollutants from unsewered areas in terms of the total catchment loading, sub-catchment loading and local effects, with each considered equally important. A method is put forward which allows development densities to be set for the overall catchment, for individual sub-catchments and for local areas within sub-catchments. The distribution of densities achieved ensures that the total pollutant loading does not significantly change the pre-development loading on the river system while allowing for local enclaves of development at densities which do not threaten the beneficial uses of any local reach of the river or stream. The approach allows planners to set overall catchment density objectives for sensitive waterways and to distribute the development within sub-catchments and localities such that water quality in local streams or individual sub-catchments is not degraded. The approach is particularly valuable for determining the critical density for clustered or concentrated developments in sensitive catchments, and may be applied to other forms of development as well as unsewered development

ON-SITE SYSTEMS ACTUAL EXPERIENCE vs GUIDELINES

Colin W. Jenkins

Principal Engineer Col Jenkins & Associates, Maclean

Abstract

Anecdotal experience has shown on-site disposal of basic septic systems have been very successful in many locations on small sites where some popular guidelines tend to suggest this is not possible. Conversely, anecdotal experience suggests where compliance with such guidelines has been met failures still occur, particularly in absorption.

This paper examines the earliest history of disposal systems in England and more recently Australia, touching on large systems as well as on-site to help demonstrate the “first principles” involved.

The writer recently visited New Zealand where he observed varying site conditions and their comparison to each other causing problems of logic in standardisation. The same issue is examined for Australia.

A section on the politics and motives addresses some of the emerging regulations. This section explains why on-site disposal systems are becoming increasingly difficult to get approved and suggests new ways of using old knowledge.

There is a view of the legal aspects of performances and likely legal outcomes and how they differ from what one might expect. A short comparison with other standards is used to demonstrate how on-site disposal matters are symptomatic of a “cover your backside” approach now sweeping many consulting fields.

The paper is a general guide to help attendees grasp the essence of what disposal methods should do for us or how to avoid “losing the plot”!

Keywords

actual performance, anomalies, guidelines, Law, politics

ON-SITE DISPOSAL : CATCHMENT MANAGEMENT AND PUBLIC HEALTH ISSUES

Michael Linich

Department of Biological Sciences, The University of Newcastle.

Abstract

Disposing of wastewater on-site, requires the operator to have a working knowledge of the basic principles of catchment management. This includes an understanding of natural attenuation and facilitated bioattenuation of contaminated sites such as those used for the on-site disposal of wastewater. There is also a need for an appreciation of the microbiology of wastewater, coupled with an elementary understanding of the sources and fates of the chemicals which pervade our everyday existence. This paper briefly reviews the distribution and fate of microbes in wastewater, their potential impact on catchments, the microbiological processes and health risks associated with on-site disposal.

Key Words

bioattenuation, biogeochemical cycle, catchment management, denitrifying bacteria, pathogens, xenobiotics.

ON - SITE SYSTEMS - SOILS, SALTS AND SOLUTIONS

Simon C. Lott¹, Robert A. Patterson² and Ryan Petrov¹

¹ E.A.Systems Pty Ltd, Armidale NSW. ² Lanfax, Armidale NSW

Abstract

On-site wastewater disposal systems aim to assimilate domestic wastewater into the environment around a dwelling. In Australia, septic tanks and absorption trenches are the most common on-site disposal system. Many parameters combine to influence the environmental performance of on-site disposal.

Most domestic on-site systems are truly 'disposal' systems where wastewaters are partially treated and then dumped into the soil. The soils are used as a simple filter or assimilation system. Soil has a limited ability to adsorb nutrients and therefore cannot be continuously loaded without leakage of nutrients in various solute and salt forms as it approaches saturation. Imbalances in the loading of solutes and salts can also result in failure of the system by biochemical oxygen demand (BOD) overload under anaerobic conditions, or soil structural collapse due to sodicity.

Design approaches to on-site disposal need to be more holistic and focussed on the 'system' health. The design of the on-site disposal systems should be based on, immobilisation capacity, buffering capacity (pH, CEC and phosphate sorption), permeability (hydraulic loading) and organic loading for clay soils. The significance of wastewater chemistry and the ability to reduce chemical loadings within the house should not be dismissed, rather considered part of the holistic approach to on-site wastewater management. The environmental ramifications of a gradual but continuous leakage from on-site disposal systems scattered throughout a catchment need to be investigated and the design criteria shifted towards a method that considers that the disposal area has a limited life.

Keywords

nitrate, phosphate sorption, salinity, salt, septic tank effluent, sodicity, sodium adsorption ratio, wastewater,

PUSHING ON-SITE SEWAGE UPHILL

Michelle Maher¹, Terry Lustig¹, and Abdellah Rababah²

1. Environmental Management Pty Ltd, Atmospheric and Environmental Department, 2. Nat Inst for Resources and Environment, Ibaraki, Japan.

Abstract

This paper presents an overview of a project where an on-site wastewater management system was developed. The approval process required for this project is discussed and used to illustrate the problems that on-site systems often encounter. While the project was eventually approved, the standards to be met were felt to be excessive, especially when compared to the existing standards and performance of centralised sewage treatment. The discrepancies between on-site approval and centralised sewage treatment are looked at, and recommendations made on how to level the playing field by considering the principles of Ecologically Sustainable Development.

Keywords

approval process, ESD, on-site sewerage, regulations

APPROPRIATE SANITATION SYSTEMS FOR ARNHEM LAND OUTSTATIONS

Glenn Marshall

WaterWays Asia-Pacific, Alice Springs, NT.

Abstract

This paper examines sanitation systems on remote Aboriginal outstations of Arnhem Land. A case study is presented to highlight the stages of inappropriate and appropriate technologies which have developed over recent decades. Systems evolved from nothing in the mid-1980's to waterborne flush

toilet systems in the early 1990's. These proved extremely problematic and were subsequently abandoned in favour of dry pit toilet systems which are currently functioning well. Greywater management has also evolved from surface disposal to current trials of subsurface disposal and irrigation of fruit trees. The trial is described in detail. The entire case study presents a strong argument for planning and designing sanitation systems to suit the lifestyle of residents and maintenance capabilities of service providers, rather than utilising standard on-site wastewater systems as prescribed by regulators.

Keywords

aboriginal, appropriate, Arnhem Land, greywater, outstations, re-use, sanitation,

SEWAGE SYSTEMS IN REMOTE INDIGENOUS COMMUNITIES

Glenn Marshall¹ and Bob Lloyd²

¹Waterways Asia Pacific, Alice Springs, NT. ² Centre for Appropriate Technology, Alice Springs, NT

ABSTRACT

A desktop study has been undertaken which has identified the present situation in Australia with regards to sewage disposal in remote Indigenous communities. The study has identified some 76,000 Indigenous people living in around 1,100 separate remote communities. 37% of this target population was found to be served by full sewage systems, 22% by common effluent disposal (CED) systems, 31% by septic tank systems, 7% by pit toilets and 3% with other systems (including systems not identified). Taking into account the difficulties of arriving at any conclusion from such a desktop study, it was found that in general the basic technologies used for sewage disposal *per se* were adequate. The problem areas concerned the installation, operation and maintenance of the sewage systems in the remote Indigenous communities. A further study looking at actual systems in the field is recommended.

Keywords

central, ced, indigenous, on-site, pit, remote, sewage,

WET-WEATHER STORAGES FOR ON-SITE WASTEWATER SYSTEMS

Daniel M. Martens

Director, Martens & Associates Pty Ltd, Newtown

Abstract

Since the release of the NSW Department of Local Government guidelines for on-site effluent management in early 1998, one of the major concerns has been the determination of where and when wet-weather storage facilities should be implemented. The possible requirement for a wet-weather storage facility, in association with an on-site wastewater management system, is both something radically new in terms of on-site management, but also something with which the industry has found very difficult to come to terms. There are numerous options which can be considered, technical difficulties to overcome, increases in cost and methods of determining the relevant size and management of the storage facility.

This paper provides some clear guidance regarding the numerous difficulties associated with the concept of wet-weather effluent storage. It considers a range of technical approaches and numerical methods for evaluating the most suitable, from both an environmental and economic perspective, method of applying wet-weather storage to on-site facilities. Included in the analyses, are detailed reviews of daily versus monthly modelling approaches, implications of 'design soil percolation' rates, in-ground and above ground storage's, soil moisture monitoring, and the implications for maintenance

and scale of works (ie. hydraulic load of the sewage treatment facility), location and ownership on the wet-weather storage facility.

Keywords

on-site sewage management, percolation rates , water balance, wet-weather storage,

AUSTRALIAN ON-SITE WASTEWATER STRATEGIES: A CASE STUDY OF SCOTLAND ISLAND, SYDNEY, Australia

Daniel M. Martens¹ and Phillip M. Geary²

¹Martens & Associates Pty Ltd, Newtown ²Department of Geog. and Env. Science, University of Newcastle

Abstract

Australian urban centres are primarily situated along wetter and more humid coastal areas, with much of the dry continental parts of the country remaining relatively undeveloped. Approximately 12 % of the population, in excess of 2 million persons, are not serviced by reticulated sewerage facilities and rely solely on on-site management for the treatment and disposal of domestic wastewaters. A relatively prescriptive Australian Standard is currently in place which provides guidance for the design and installation of domestic wastewater management systems. A new joint Australian and New Zealand performance based standard is in the final stages of revision and should provide for improved management of domestic wastewater management systems. A description of this new code is included elsewhere in these proceedings.

A case study of Scotland Island, in Sydney's Pittwater Bay on the lower Hawkesbury River estuary is cited. The unsewered island has a population of approximately 1100 and represents a microcosm of the nation at large. A major environmental study conducted in 1996 indicated that many of the existing conventional septic tank / drainfield installations were failing and causing very high levels of nutrient and bacterial pollution in local streams.

Since the study, wastewater issues have been addressed through more rigorous application of the existing Standard and the anticipated implementation of the new performance based Standard. All new homes and modifications to existing homes (where domestic effluent loads are likely to increase) are now required to meet the Standards criteria. This has resulted in significantly improved wastewater management on the Island and reduced potential public health risks. Whether improved environmental amenity also follows still remains to be seen.

Keywords

on-site, Scotland Island, sewage treatment, soil studies standards,

WALKING THE TIGHTROPE BETWEEN PRODUCING EFFECTIVE AWTS AND SATISFYING THE REGULATORS

Bob Martin

President AWTS Manufacturers' Association

Abstract

This paper charts the history of the development of the aerated wastewater treatment system (AWTS) and compares it with its overseas counterparts. It also shows that the management of on-site disposal regulations has been less than satisfactory. This has meant that the rural population of NSW has missed out on being able to develop land for residential use. It also means that there has been and will continue to be unnecessary expenditure of taxpayers' money to provide sewage treatment plants to cater for the urban sprawl.

This paper primarily discusses the situation in NSW and particularly the Sydney Basin, as that is where the majority of AWTs are installed and it is where most manufacturers are situated. It also discusses the NSW On-site Disposal Guidelines for Single Households and the NSW Health AWTs Accreditation Guidelines.

The necessity to publish the On-site Disposal Guidelines is the result of the lack of Government enforcement of its own regulations. There is an urgent need to ensure that houses without sewerage facilities do not pollute the environment. However, these regulations are not the way to achieve that outcome. Bureaucrats who have little or no experiences of living without sewerage have produced them without “genuine” public and industry consultations. The regulations are trying to rectify the mistakes of the last fifteen years in one attempt instead of implementing a gradual upgrading of on-site disposal methods. In this way alone they will fail.

Keywords

accreditation, aerated wastewater treatment systems (AWTs), IFAT’99, NSW Health guidelines, on-site disposal, regulations, re-testing, reuse of resources, STP

MODIFYING WASTEWATER INPUTS TO ON-SITE SYSTEMS

Robert A. Patterson

Director, Lanfax Laboratories. Armidale

Abstract

The cocktail of chemicals in domestic wastewater presents a significant problem for on-site application to the soil and plant environment. Highly corrosive and toxic chemicals are available for indiscriminate use within the household, for subsequent disposal to the wastewater stream. Many of the chemicals are capable of inducing soil dispersion and loss of hydraulic conductivity while others are potential bactericides, destroying essential soil microbes and diminishing within-soil treatment expected of irrigation or disposal areas.

The key to the modification of the chemistry of the wastewater stream is to reduce water consumption and remove products at source, that is, prevent their entry to the wastewater stream. However, the alert consumer is unaware of the components in many household chemicals, and inadequate labelling ensures that such ignorance will continue. Labels with confusing messages are typical among many household products, particularly laundry and kitchen cleaning agents.

Additional treatment, new treatment technologies or improved monitoring will not address the significant problem associated with chemicals such as sodium and strong acids and strong alkali materials. Removal of the offending products from the supermarket shelves appears to be the most immediate solution together with “low sodium” initiatives for household cleaning products.

Keywords

detergents, household chemicals, washing machines, wastewater, water conservation

PEAT TREATMENT OF SEPTIC TANK EFFLUENT

Robert A. Patterson
Director, Lanfax Laboratories. Armidale NSW

Abstract

Noxious products in septic tank effluent prevent its direct application to landscaped areas around the home, except through subsurface soil systems. Reduction in these components can be achieved through better treatment, often with significantly higher energy, chemical and maintenance inputs. The use of low energy treatment, by percolating effluent through a peat bed, has been explored as a means of reducing suspended solids, nitrogen and phosphorus products and faecal coliforms.

Following a series of laboratory experiments to evaluate loading rates, a peat bed of 18 m² was constructed as part of the on-site wastewater treatment system connected to a typical household. Effluent from an all-waste, single chambered septic tank flowed to a distribution system above the surface of the peat. Effluent passing through the peat was collected in a collection well, from where it was pumped to irrigation areas.

Over a period of 13 years, significant reductions in suspended solids, biochemical oxygen demand, nitrogen, phosphorus and faecal coliforms have been achieved with almost no maintenance of the simple system. It is concluded that significant improvement in the quality of effluent available for surface or subsurface irrigation will reduce environmental impacts and allow on-site systems to operate on small parcels of land.

Keywords

faecal coliforms, peat, phosphorus sorption, septic tank effluent, wastewater

ON-SITE WASTEWATER MANAGEMENT, TREATMENT AND DISPOSAL IN FOUR PACIFIC COUNTRIES

Harald Scholzel¹ and Rhonda Bower²

¹Economist Civil Engineer ²Chemist. South Pacific Applied Geoscience Commission (SOPAC)

Abstract

The paper summarises the policies, regulations and guidelines governing the implementation of on-site wastewater treatment in Fiji, Kingdom of Tonga, Niue and the Marshall Islands. It analyses the administration structure as well as the current situation of implemented projects. It identifies appropriate on-site technologies and their implementation requirements. One striking result is that no straightforward responsibilities exist and that wastewater treatment in Pacific Island Countries has a very low profile and is widely neglected by Government agencies. New projects facing difficulties with finding the correct authority to address and face a very little skilled people to implement solutions. The same lack of technical skills lead to the deterioration of existing problems producing severe health risks to the public. The paper identifies that through careful community assessments implementation strategies can be obtained. However, the lack administering and technical skills within formally responsible authorities impedes a widespread possible improvement of the sanitation issue in those four Pacific Island Countries.

Keywords

Sanitation, Pacific Islands, Appropriate Technology

ON EFFLUENT INFILTRATION IN SPITE OF WATERLOGGING

Robert H.M. van de Graaff¹ & Joost Brouwer²

¹ van de Graaff & Associates Pty Ltd, Park Orchards, Vic.,

² Brouwer Environmental and Agricultural Consultancy, Bennekom, The Netherlands

Abstract

Seasonal intermittent waterlogging of an on-site effluent disposal field is persistently, but often wrongly, equated with failure. The view that if the soil is “full of water” then it is not possible to add more water is too simple and static an analysis. This misapprehension leads to an excessive emphasis on determining the maximum height of the perched water table in a soil, in order to rate the potential of that soil for effluent disposal. It leads to further error by the consequent notion that the measurement of soil permeability ought to be done at that time when the soil is at its most waterlogged, which is precisely the condition when such a measurement can only produce an invalid result.

As our field observations show, even while a soil is suffering from seasonal intermittent waterlogging, effluent “absorption” is still taking place. In addition, the storage capacity of the trench (different per trench type) can help tide over periods of slow absorption. We have quantified these effects and incorporated them into a series of equations for sizing domestic septic tank effluent disposal fields, presented in this paper. The method can also take account of main infiltrative surfaces (trench bottom, sidewall or both); runoff; any evapotranspiration of effluent by vegetation directly over the trench; and evapotranspiration by vegetation in a border zone adjacent to the trench (zone width dependent on vegetation type). We also discuss the logical inconsistency of the argument that soil permeability needs to be tested when soils are at their wettest. We conclude that, in judging the potential of an area for effluent disposal, the duration and severity of seasonal intermittent waterlogging should be assessed from soil profile characteristics and/or hydrological monitoring. Permeability tests, on the other hand, should be used exclusively for determining soil permeability as a step in sizing effluent disposal systems, and not for assessing soil water regimes.

Keywords

Intermittent seasonal waterlogging, septic tank effluent absorption failure, permeability testing, domestic wastewater, Melbourne, Victoria, Australia

RESPONDING TO THE CHANGING TRAINING NEEDS OF ON-SITE WASTEWATER MANAGEMENT PROFESSIONALS

J H Whitehead¹, P M Geary², M Linich³ & R Patterson⁴

¹Centre for Environmental Training, NSW, ²The University of Newcastle, NSW,

³Northern Ecoremediation Technologies, NSW, ⁴Lanfax Laboratories, NSW.

Abstract

In recent years, there have been significant changes in the local, state and national regulations affecting on-site wastewater management in Australia. At the same time, major advances in the scientific, engineering, public health and management aspects of on-site wastewater management have occurred. An increasing range of professions are involved in on-site wastewater systems; amongst them planners, surveyors, engineers, catchment managers, geoscientists, environmental consultants and environmental health officers. In responding to the increasing and changing demand for training in

this area, the Centre for Environmental Training has established itself as the leading provider of on-site wastewater management training in Australia.

Careful needs analysis, on-going revision and updating have ensured that the programs offered have developed to provide training in the appropriate skills for a range of participants from varied backgrounds. Key elements of the programs have been the practical laboratory and field workshops which impart the requisite skills for participants from specific disciplinary backgrounds to play an effective part in what has become a multidisciplinary industry. Amongst the skills imparted are those of site assessment, soil analysis, catchment management, wastewater characterisation, system selection, system sizing, system performance assessment and environmental health impact evaluation.

This paper reviews the recent trends in training and the background of trainees, and identifies possible future directions.

Keywords

AS/NZS 1547, catchment management, environmental training, on-site wastewater management, regulatory guidelines, site assessment, soil analysis, training curriculum,