EDITORIAL

The issue of the moment seems to be management of nutrients in the effluent discharges from on-site wastewater systems. On-Site NewZ has received several communications in recent weeks regarding the availability of research and monitoring information related to NZ conditions. What concentration or per capita levels of nitrogen and phosphorus are contributed to the environment in septic tank effluent? Do the new tanks under AS/NZS 1546 improve removal performance? How much nutrient material is taken up by the soil and plants within the land application area? Are nitrification/denitrification processes within the soil adequate to remediate this nutrient so as to protect groundwater quality for drinking purposes, and limit environmental impacts within nearby receiving waters? What is the basis for the limit concentrations in various Regional Rules around the country? These are the sort of questions at the forefront of enquiries received to date, and for which On-Site NewZ has no ready answers.

The issue is also very much alive in Australia. AUS-ITEms in the January 2001 issue of On-Site NewZ presented information from the October 2000 NOSSIG News (the companion Australian on-site newsletter) on this topic. The April 2001 edition of NOSSIG had a feedback item on the nitrogen question, setting out two views. One was based on sizing land application areas on hydraulic loading only, and allowing nitrogen to be taken up in the buffer area downslope of and outside the design area. The other is based on detailed soil moisture and nutrient budget modelling to determine design requirements for land application systems within the variation of soil landscapes throughout a specific local government area.

In addition, a recent paper in the Journal of the Australian Water Association (reviewed in this April issue below) has raised the question as to whether the new AS/NZS Standards are adequate in addressing the matter of on-site system environmental impact in sensitive catchments. Does AS/NZS 1547:2000 provide guidance on management of pathogens and nutrients which reflects best possible management practice?

The ultimate question is, what constitutes “best management practice” for nutrients within on-site wastewater servicing? It seems that there are a wide range of views on this subject, and that the lack of definitive information regarding nutrient outputs into the natural environment from septic tank and land application areas is hindering the refinement of those views into practical guidelines.

Does anyone out there have information or comment on these topics?

Ian Gunn
This question is raised in the December 2001 Volume 28, No. 8 issue of “Water”, the Journal of the Australian Water Association, within a paper entitled “Australasian Standards for On-site Sewage Management: Application in the Sydney Drinking Water Catchments”. The authors are Katrina Charles, Nicholas Ashbolt and David Roser (Centre for Water and Waste Technology, School of Civil and Environmental Engineering at the University of NSW) together with Daniel Deere and Robert McGuinness of the Sydney Catchment Authority. The paper addresses not only the question of nutrients (nitrogen and phosphorus), but also of pathogens (viruses, protozoa).

The Sydney Catchment Authority is responsible for protecting water quality in Sydney’s drinking water catchments and minimising risks to public health from pathogens and nutrients. Hence the Authority’s concern at the reported high failure rates of on-site wastewater systems. One report indicated visible effluent surfacing at 40% of septic effluent absorption trenches, and another found 95% of aerated wastewater treatment systems failing to comply with at least one effluent quality parameter attached to their approval under NSW guidelines. Although such studies have not specifically identified adverse environmental impacts nor directly measurable effects on human health or the ecology, the Authority is specifically interested in whether the new Standard will reduce system failures and provide improved protection to human health and natural environments through measures which address pathogens and nutrients.

The authors summarise the main elements of the new AS/NZS 1547:2000, and comment that it is a significant advance on the previous Australian standard, particularly in respect of the provision of improved effluent land application system design criteria, and the introduction of management recommendations. They use a table comparison of past and present Australian standards with those in Europe and the USA to state that AS/NZS 1547 compares well in the international arena. The table shows that both the Australian and US standards have “inadequate coverage of nutrients and pathogens”, and the European standards have no coverage.

In exploring weaknesses in AS/NZS 1547 relative to managing nutrients and pathogens in the Sydney Catchment Authority area, the authors acknowledge that the design criteria will result in reduced risks to water quality in the long-term. However, there is very limited guidance in the standard on how its performance objectives for protecting public health, the environment, and community amenity, are to be achieved. Certainly there is nothing in the standard that adequately covers the quality concerns of the Authority related to protecting natural water quality. Key deficiencies are identified as:

- Reliance on thermotolerant coliforms as an indicator of public health risk (and placing the responsibility to assess consequent risk on inexperienced local authorities);
- No guidance on buffer zones for attenuating the impacts of pathogens and nutrients (the responsibility for setting separation distances being placed upon “often poorly resourced” local authorities);
- No links to receiving water quality requirements such as the ANZECC & ARMCANZ 2000 guidelines (initially drafted in 1999 while the standard was also being drafted).

Overall, the authors conclude that AS/NZS 1547:2000 is deficient in addressing pathogen and nutrient issues in sensitive areas such as the Sydney drinking water catchments. They suggest exploration of the following improvements:

- Standard methods for on-site wastewater system failure detection, system monitoring and remediation, and tracking and recording maintenance procedures;
- Development of tools for determining nutrient balances relative to setting buffer distances appropriate to the receiving environments;
- Workable effluent quality criteria for on-site systems (including pathogens and nutrients);
- The linking AS/NZS 1547 to water quality targets and environmental management guidelines.

The Centre for Water and Waste Technology (CWWT) is now working with the Sydney Catchment Authority (SCA) in addressing such improvements to complement the provisions of AS/NZS 1547. This is to include a risk assessment to provide information on cumulative impacts from on-site systems at a catchment scale, and to determine the best methods of managing those risks (via use of particular technologies; via the setting of buffer distances).

**Editor’s Comment:** Having been involved in the development of the new suite of joint Australia/New Zealand standards for over 5 years, one can appreciate that the finished products will not cover the expectations of all potential users. The matter of setting environmental criteria for use of on-site systems in sensitive catchments was never on the agenda of the committee. Indeed, the standards do not cover all types of pre-treatment and land-application systems currently in use in both countries, nor was this the objective of the committee. Also, as work on the standard progressed it was hard to draw the line between what constitutes a “standard” and what constitutes a “design manual”.

The most significant measures in AS/NZS 1547 as an “on-site domestic wastewater management” document is the Part 3 requirements which deal with the implementation processes involved in design, installation, and operation and maintenance, and the responsibilities and training of those persons who
undertake that implementation. This makes the standard totally different to previous technical standards related to on-site systems, as the emphasis is not on providing comprehensive design standards, but on ensuring that good design practice for selected pre-treatment and landscape systems is delivered in an appropriate environmental context by skilled (well trained) professionals. The environmental context cannot be specified, as environmental rules and objectives vary so much between state agencies and local government authorities throughout Australia, and the many regional authorities in NZ. There is thus no generic approach to nutrient and pathogen management that could possibly be incorporated within such a document. AS/NZS 1457:2000 emphasises the importance of taking into account both local and cumulative environmental effects at all stages of the implementation process, but cannot specify the detailed criteria that should apply. Just looking at the range of views on this matter in recent NOSSIG issues illustrates the variety of opinion and practice in this area.

Hence, the presumption of the team from CWWT and SCA that the standard would provide guidelines for sensitive catchment situations was somewhat misplaced. They are, however, setting out in the right direction to resolve this matter by developing environmental management tools to complement the design and management provisions of the standard, all within the specific context of the catchments in which they are working. We will await with interest for a further report at some stage on the results of their efforts in developing a partnership between AS/NZS 1547:2000 and catchment based environmental objectives.

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CAROLINA ONSITE WATER RECYCLING ASSOCIATION - COWRA

On-Site NewZ is now exchanging newsletters with the above association through contact with Editor Dr Willem van Eck, who has a NZ connection through his wife Ngaire (originally from Christchurch). Willem is President of COWRA as well as President and Professor Emeritus of the NC Academic Associates Inc & WV University. COWRA is, of course, part of the network of nation-wide associations affiliated within the National Onsite Water Recycling Association (NOWRA) in the US.

NOWRA has played a major role over many years in developing information transfer between on-site wastewater professionals at all levels, from installers to designers, educators and rule makers, through its organisation of working groups and conferences. However, Willem reports slow progress in the Carolinas in developing a flexibility of approach within the regulatory environment. The focus seems to be on a fairly narrow and tight control over rules and permits. There is a limited appreciation of the larger vision promoted by NOWRA, with its current major project of drafting a model performance code for on-site systems.

At the local level in North Carolina, the NSCU is making a major contribution nationally through Dr Bob Rubin’s work with the US-EPA on on-site management options, and Dr Mike Hoover in providing training and education modules for the wide range of practitioners in the on-site industry. Willem notes that in spite of all that is happening in North Carolina in these areas, installers are still not required to be licensed, thus limiting opportunities for the transfer of new ideas.

The last COWRA newsletter (issued quarterly) for 2001 had a major item by David Venhuizen, well known in on-site circles (see <www.venhuizen-ww.com>), and entitled “Decentralized Wastewater Treatment: The True Regional Strategy”. David put his finger on the slow acceptance of this concept. He states that:

By judicious choice of technologies, the presence of many small dispersed treatment centers would not create the untenable operations and maintenance liability that the concept’s detractors claim. There would be an organizational challenge in setting up the management system to address dispersed treatment centers, and that is probably the biggest reason why this alternative concept is resisted by operating entities, engineers which serve them, and regulators which permit and oversee them. They feel they have “control” over a single centralized facility but would not be able to “ride herd” on many dispersed facilities. That view is colored, I believe, by experience with conventional treatment methods and lack of familiarity with “alternative” methods.

Somehow, David’s assessment seems fairly relevant down this end of the world as well.

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TECHNOLOGY UPDATES

Gravelless Trench Systems

The use of alternative distribution media in conventional trenches for septic tank effluent often comes up as a question where the availability and/or cost of gravel media is a problem. A recent issue of “Pipeline”, Summer 2001, Vol. 12, No. 3 (a US EPA National Small Flows Clearinghouse publication – see <www.nsfc.wvu.edu>) is devoted to this topic.

In place of gravel or stone chip, alternative materials include rubber, sand, fiber membrane, plastic, glass, expanded clay, shale, or polystyrene foam chips. One commercially available alternative system is 200 to 250 mm dia corrugated ‘draincoil’ type line wrapped in a special geotextile fabric or a spun bonded nylon filter. “Pipeline” outlines the pros and cons of conventional gravel trench media against such alternatives, and explains when and why gravelless media might be appropriate.

Also discussed are domed ‘chamber’ systems in high-density plastic. Light and easy to install, the chamber units are costly compared to the material costs for gravel media and distribution line systems. However, being
light and easy to assemble provides economies in transport and installation that aid in offsetting the material cost difference.

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AS/NZS 1547:2000 PERMEABILITY CORRECTION

Bill Cromer of Tasmania is an engineering and groundwater geologist who has developed his own constant head permeameter. This unit is robust and low-cost, and available from Bill who manufactures and distributes it (<billcromer@bigpond.com>). Bill has also developed the on-site system design software program, Trench®3.0.

In the August 2001 issue of NOSSIG, he draws attention to a typing error in the equation for calculating permeability in the new Standard (Clause 4.1F6, page 106). The equation is shown as (typing error in bold type):

\[ K_{sat} = 4.4Q \times 0.5 \sinh^{-1} \left( \frac{H}{2r} \right) - \left( \frac{r}{H} \right)^{0.5} + \frac{r}{H} \]

The correct equation is:

\[ K_{sat} = 4.4Q \times 0.5 \sinh^{-1} \left( \frac{H}{2r} \right) - \left( \frac{r}{H} \right)^{0.5} + \frac{r}{H} \]

Bill also points out that the units for \( K_{sat} \) in the equation are in cm/minute, but elsewhere in the Standard are in m/day. This is a bit of a trap for inexperienced users. He states that \( K_{sat} \) in cm/minute is readily converted to m/day by multiplying by 14.4. He has also compared permeabilities calculated by three different equations (including the corrected AS/NZS 1547:2000 one above), and found satisfactory agreement within the accuracy required for on-site wastewater management purposes.

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ON-SITE SNIPPETS

Newsletter out of Palmerston North

Dave Miller of Palmerston North operates an advisory service and web-site re on-site wastewater systems. Recently he has added a newsletter to his suite of information products. The two newsletters to date (the latest being February this year) can be downloaded from <www.davemiller.co.nz>.

EMS Piped Network Program

The April 2001 issue (01/2) of On-Site NewZ referred to the development grant awarded to EMS of Havelock North (not Gisborne, as incorrectly stated in the item) for software design. This project is now complete, and information on the program can be obtained from EMS (contact details on <www.emsnz.com>). It is used for design of pump dosed trench systems, and determines the distribution line size and squirt hole spacing for two hole sizes, 3mm dia. for pressures greater than 1 metre, and 6 mm dia. for pressures less than a metre.

Laundry Powder Impact on Septic Tank Operation

Two South Island callers have contacted On-Site NewZ recently regarding the potential impact of laundry powders on biological activity in both septic tanks and aerated treatment plants. Anecdotal information from the North Canterbury area suggests that septic tank pumpout contractors are finding up to 60% of tanks not functioning properly – no scum on the surface, and a rather non-normal sludge accumulation. “The bugs are failing in many septic tanks” was how it was put. The question that seemed to be in the forefront of commentators opinions was, “to what extent are laundry powders in modern washing machines likely to be having an effect?” The answer is, no one seems to know.

In one case an aerated treatment plant serving a motel which had its own laundry was recording a pH of 12.2. Bacterial activity, both anaerobic and aerobic had ceased in the treatment chambers, although other contributory factors had not been entirely ruled out.

On-Site NewZ would welcome any comment on this topic.

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CORRECTION – Special Report 01/3, Oct 2001

The Part 1 report on selected papers from the September 2001 On-site ’01 conference had an error in the text for Item 2, the constructed wetlands review. In the third paragraph it states (error in bold):

Design surface area loading works out at around 200 mm/day, and evaporative losses under good conditions can be around 80 mm/week.

The correct version is:

Design surface area loading works out at around 200 mm/week, and evaporative losses under good conditions can be around 80 mm/week.

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AUS-ITEms - NEWS ACROSS THE TASMAN

International Conference on On-site Waste Treatment and Recycling, 28-31 January 2004

The Environmental Technology Centre at Murdoch University in Perth, Western Australia, is currently preparing the first announcement and call for papers for the above event. To get on their mailing list, contact <ETC@essun1.murdoch.edu.au>.

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