water NEW ZEALAND
The New Zealand Water & Wastes Association Waiora Aotearoa

On-site Wastewater Management Systems Risk and Mitigation

Authors: John Cocks
Andrew Dakers
Hamish Lowe

22 March 2024

OWMS Group
Onsite Wastewater Management Systems
WATER NEW ZEALAND

Contents

1 Introduction

The On-site Wastewater Management Systems special interest group of Water New Zealand (Water NZ) (OWMS SIG) is concerned about the growing public health and environmental risks resulting from on-site wastewater management. This paper explains reasons for this and presents an action plan to better understand this issue and identify solutions.

The intended audience is parties involved in regulating and setting the direction and requirements of the on-site wastewater industry, including managing effects of such systems.

This paper does not seek to address or develop actions for cultural matters related to on-site wastewater management. While we acknowledge on-site wastewater management systems (OWMSs) could result in cultural risks, these are beyond the scope of this White Paper.

The authors gratefully acknowledge the OWMS SIG Management Committee's endorsement of this paper.

2 Premise

The adverse public health and environmental effects of on-site wastewater management systems (OWMSs) can be significant and are often misunderstood by policy developers and decision makers.

3 What is an On-site Wastewater Management System (OWMS)

The fundamental components of an OWMS are a wastewater treatment unit and a land application system (LAS).

An OWMS must be designed for both the wastewater source and the land into or onto which the treated wastewater will discharge. These vary from site to site. The successful performance of an OWMS is dependent on a sound understanding of each.

Most commonly, an OWMS serves a single household. An OWMS can also serve any establishment where wastewater is generated and not connected to a community wastewater scheme e.g. schools, public halls, marae, hostels, motels, camping grounds, national parks facilities and more in rural and backcountry areas.

Definitions vary and some are given in Attachment A.

4 Why are adverse effects considered significant?

4.1 The number of OWMss is not known

The population served by on-site systems is large and not monitored regionally or nationally. Estimates of the number of systems vary e.g.

- WaterNZ (2023) reporting "*The estimated number of OWMSs is between three and four hundred thousand, or about 18 percent of or nearly one in five New Zealanders. Not included are non-residential places such as halls, restaurants, ski fields, and wineries and may only include buildings that are used as single household units (ie excludes lodges, backpacker accommodation, camping grounds, backcountry huts).*"

- New Zealand's Greenhouse Gas Inventory 1990–2017, MfE 2019. *The total population connected to treatment plants was estimated to be 3.8 million. The connected population excludes people connected to rural septic tanks, estimated at 471,000 people in 2017, and approximately 52,000 people using other aerobic plants. A remaining population of 485,000 people is not accounted for, which is a result of incomplete data on the wastewater treatment plants in New Zealand and the populations connected to each of these plants being estimated.*

Not knowing the magnitude and locations of so many discharges poses a potentially significant risks to people and the environment.

4.2 Public Health Risk

The risk of people getting sick from an OWMS is high. They could be those in a household or a community reliant on drinking water supply contaminated by the OWMS. The risk is real and such adverse public health effects have been attributed to substandard and failing on-site systems. Recent reports highlighting this risk include:

- OECD Environmental Performance Reviews (New Zealand 2017). *New Zealand has relatively high rates of largely preventable enteric or gastro-intestinal disease (Ministry of Health, 2016). The campylobacteriosis rate in New Zealand is twice that of England, and three times that of Australia and Canada; this is partly attributable to contamination of drinking water sources (Ministry of Health, 2016). Leaking septic tanks and sewerage pipes are often the main pollution culprits (this is particularly a problem in Canterbury following damage by the 2011 earthquakes). However, under some conditions rainfall and irrigation can flush livestock faecal microbes through the soil profile with the potential to contaminate groundwater (Close et al., 2008; Collins et al., 2007).*

- guidelines for separation distances based on virus transport between on-site domestic wastewater systems and wells (Moore et al 2010). *For a developed country, New Zealand has some of the highest notifiable disease rates for diseases that are potentially waterborne, e.g. campylobacteriosis (159.9 cases/100,000 population5). Furthermore, such rates are likely to be under-reported by a factor of between 10 and 100. This was adversely commented on by the OECD in 2007*.

The risk of poorly performing OWMSs to public health is not new. The Ministry of Health initiated the Sanitary Works Subsidy Scheme (SWSS) in 2002, primarily to address problems with on-site systems. (refer Attachment B). As noted by the minister at the time *"Sanitary works are the most effective and usually the most efficient means of managing the risks to public health associated with drinking water and inadequate sewage treatment."* And *"Without the help of a subsidy, a small community with a badly maintained sewage treatment system could expose the community to disease-causing pathogens or bugs. Storm water or sewage overflows, perhaps caused by heavy rain, can increase the risk of water-borne diseases travelling through a community."*

4.3 Rules for OWMSs vary in Regional Plans

Regional Councils have permitted activity rules in regional plans to manage discharges from household on-site wastewater systems. The rules vary from region to region.

Typically, the cumulative effects are not considered with these rules, especially where there are:

- older systems in well-established unsewered residential communities, and
- newer developments with high densities and/or poor control of design and management.

5 How effects are managed currently

5.1 Regulation

OWMSs are regulated primarily under the RMA via regional plans and the Building Act via the Building Regulations and the Building Code. Provisions of the Health and Safety in Employment Act are also pertinent. Further, new regulations under water services legislation are expected.

There are two overlapping aspects of on-site system regulation. The 'building' aspect of a system is regulated under the Building Act and administered by a Building Consent Authority. A building consent is required and there is (largely) national consistency. The 'discharge' aspect of the system is regulated under the RMA administered by Regional Councils on a region-by-region basis. A resource consent is not required for permitted activity.

The overlapping responsibilities between Building Consent Authorities and Regional Councils, and variation in policy and rules in regional plans, result in inconsistences in regulatory boundaries, design, management, monitoring, and approval processes.

Specific issues and aspects that contribute include the following.

- Many Regional Councils utilise New Zealand Standard AS/NZS 1547:2012 *On-site domestic wastewater management* to prescribe requirements for OWMSs. Some have developed their own guidance document as an alternative to the standard (eg Auckland Council TP58).

- The Building Act defines a building, and an OWMS is a system that forms part of a building. The Building Code has Acceptable Solutions that prescribe requirements for the components of buildings. And in addition, typically, the Building Regulations prescribe acceptable solutions for building components. However, such an acceptable solution is not prescribed for an on-site system – despite being part of the building. A verification method (G13/VM4) is given, which loops back and cites sections of AS/NZS 1547: 2012 –which some Regional Councils do not use.

- AS/NZS 1547:2012 gives performance requirements for managing risks. This Standard is not well understood nor implemented consistently throughout New Zealand by regulators and practitioners.

- New Zealand Qualifications Authority (NZQA) unit standards (Connexis Infrastructure ITO) for design, construction, or operation of on-site systems exist, but are outdated and acknowledged by the industry as being in urgent need of an update.

- Under the Plumbers, Gasfitters and Drainlayers Act 2006 only a registered drainlayer is permitted to connect drains to and from a wastewater treatment unit. There is no collective regulatory responsibility for minimum standards for installation. As a result, the risk of substandard design, installation and maintenance is high.

- People assessing, including building inspectors, in many cases do not have the necessary skills and expertise and if they do, identification of a standard to evaluate against is complicated and in many cases inconsistent.

- OWMS components increasingly include sophisticated technologies. A national regulatory design certification or a warrant of fitness scheme for the key components does not exist. Further, the national independent treatment plant performance test platform at Rotorua (OSET NTP) ceased its services at the end of 2018. (Refer to https://www.waternz.org.nz/OSET) so there is no means of national performance assessment and certification.

As a final note, a single, poorly designed, installed or maintained OWMS could put many drinking water supplies at risk i.e. downstream water users.

5.2 Monitoring and Compliance

Most OWMSs are not formally monitored in terms of their performance and effects on public/private health and the environment. This is largely because:

- discharges from many, perhaps the majority, are permitted activities under Regional Council plans. While rules in the plans vary, many do not require monitoring;
- establishing individual monitoring systems is logistically challenging for regulatory authorities and expensive for system owners;
- given the large number of OWMSs, developing and maintaining a national or even a regional database would be time consuming and expensive, and is currently not done; and
- effluent treatment processes in the land application part of an OWMS are poorly understood and often not recognised.

5.3 Industry Concerns

Wastewater industry and regulatory authority concerns for OWMSs are not new. In the last 20 years key industry discussions and actions have highlighted the need for coordination and action – at a national level. A selection of gatherings that have highlighted consistent concerns include:

- New Zealand Land Treatment Collective (NZLTC) Conferences / workshops identifying key issues;
- *On-site Wastewater Management Systems (OWMSs) Workshop Summary Document*, 3 May 2021 – Palmerston North (Attachment C);
- NZLTC, Gisborne Conference 2016 Achieving Excellence with On-site Wastewater
- NZLTC One day Workshop, Rotorua – On-site Wastewater Treatment 14th November 2012; and
- The national environmental standard (and discussion documents) which was proposed in 2008, *Proposed National Environmental Standard for On-site Wastewater Systems*, MfE 2008 and 2009. This was not progressed by the government of the day.

6 Affected Parties

The most affected parties are those who are or may be directly or indirectly affected by discharges from OWMSs. Those parties include:

- people on and adjacent to the properties with the systems;
- people dependent on water supplies downstream of discharges; and
- people using recreational waters downstream.

Those responsible for safeguarding the interests and protection of the above parties include:

- those who own and use OWMSs. This includes, albeit with exceptions, those who are not connected to sewerage (i.e. gravity or pressure sewer reticulation) such as householders, occupants of lodges, maraes, restaurants, community halls, wineries, backcountry huts and more;
- regulators including Taumata Arowai, Water Service Entities, Territorial Authorities, Regional Authorities, Ministry of Health, Department of Conservation, WorkSafe, Ministry of Business, Innovation and Employment;
- those involved with the design, construction, installation, servicing, monitoring, or operation of OWMSs;
- those representing practitioners including Water NZ, EngNZ, Engineering General Practitioners (EGP), BOINZ, Master Plumbers, Water Services Managers Group; and
- those who manufacture components for OWMSs.

7 Barriers

Barriers that inhibit the development of a consistent national approach to OWMS management include:

- incomplete record keeping and analysis of effects of on-site systems;
- limited data that enables resolving causes of notifiable diseases on a case-by-case basis for consideration by regulatory authorities;
- limited analysis of receiving environmental effects from unsewered communities, high intensity lifestyle developments, and other discharges from on-site systems;
- insufficient regulatory-driven processes that ensure minimum standards are maintained;
- absence of a definition of an OWMS that is used by all regulatory organisations nationally;
- absence of national fit-for-purpose qualification for practitioners and regulators;
- absence of agreed definitions for and certification of "suitably qualified" OWMS practitioners;
- lack of commitment, funding and resources for local targeted OWMS research and development;
- lack of support for certification of performance of critical OWMS components (e.g. treatment plants);
- fragmented or disparate regulatory controls e.g. RMA, WSA, BA, regional plans.

8 Proposed Actions

The following proposed actions are suggested:

a) prepare further material to assist with highlighting and communicating what we consider is a significant public health – refer to list that follows;
b) finalise this paper and action plan and ideally obtain full OWMS SIG Management Committee support;
c) obtain Water NZ endorsement of this action plan, including support from Water NZ for:
    - views on how OWMS SIG can get recognised and involved in the wastewater services industry;
    - endorsement to go wider under the Water NZ umbrella; and
    - funding to support effort of contributors.
d) at a national Level:
    - document the scale and effects of OWMSs:
        - obtain validated metrics about scale/number of OWMSs at a regional and national level;
        - collate known validated (adverse) effects for OWM.
    - seek support of stakeholders for a national program of coordination.
e) identification of key stakeholders, including:
    - central government: MfE, MIBE, MPI, MoH
    - water regulator: Taumata Arowai
    - industry bodies: Water Services Managers Group, BOINZ, EngNZ, EGP, OWIMANZ, Others?
f) Engage in advocacy to highlight the potential public health (and environmental) risks associated with:
        - Regional Council awareness for addressing OWMS issues in fresh water regional plan changes;
        - Territorial Council awareness for addressing OWMS issues in District Plan changes;
        - submissions on regional plans, promoting:
            - the adoption of a common definition for the OWMS eg consistent with AS/NZS 1547 definitions?
            - common use of national standards
            - the development of a regional OWMS data base as being considered by ECan
            - requirement of minimum level of site and soil evaluation, and design
            - requirement of a minimum level of training for design, install and maintenance
            - defining "suitably qualified" and the appropriate certification for key OWMS practitioners and providers
            - common method of regulating land application systems.
        - Support of others in the public health arena including:
            - MoH
            - university medical school public health departments etc
    - Support of other professional organisations that have regulatory influence including:
        - NZ Planning Institute
        - NZ Environmental Society
        - Engineering NZ
        - others.

- develop strategies and implement measures to raise the standard of OWMS design nationally;
- R&D and certification support for manufacturers of OWMS technology components (e,g, treatment plants);
- R&D resources and funding for advancing OWMSs risk mitigation;
- understanding perspective of decision makers such as MfE, regulatory authorities;
- phone surveys, circular letters (perception of OWMSs, view of needs / solutions); and
- develop mitigation options and plan solutions.

9 Further material

To assist with engagement and further discussions, the following material and resources are needed:

- develop common engaging graphics
- establish an industry accepted risk matrix (at least methodology)
- identify parties we need to engage with
- establish common definitions, including comparing definitions from elsewhere
- collate on-site rules around country
- identify what standards different regions use
- set out a plan of what things could look like
- agree on areas that need attention
    - -regulation
    - -design WWTP, discharge
- establish presentation package for regulators - 2 levels (high and then slightly more detail
- developing an approach consistent with 3 water model
- set a vision of what the landscape should look like – what is success
- identify areas of OWMS industries that need attention (see workshops).

10 References

ARC Environment. 2004. *On-site wastewater disposal from households and institutions.* Auckland Regional Council. Technical Report 58. Also refer to: On-Site New Zealand special report 05/1.

ARC Environment. 2021. Z, Chen and G Silyn Roberts. On-site Wastewater Management in the Auckland Region. Auckland Council guideline document, GD2021/006, © [2021] Auckland Council.

AS/NZS 1547:2012. On-site domestic wastewater management.

Moore, C, Nokes, C, Low, B, Close, M, Pang, L, Smith, V (2010). Guidelines for separation distances based on virus transport between on-site domestic wastewater systems and wells. ESR Crown Research, Client Report No. CSC1001.

Ministry for the Environment, 2019. New Zealand's Greenhouse Gas Inventory 1990–2017.

Ministry for the Environment 2008 and 2009. Proposed National Environmental Standard for On-site Wastewater Systems.

OECD Environmental Performance Reviews (New Zealand 2017). https://www.oecd.org/newzealand/oecd-environmental-performance-reviews-new-zealand-2017-9789264268203-en.htm", page 163

Sanitary Works Subsidy Scheme (SWSS) 2002. Sanitary works subsidy scheme approved | Beehive.govt.nz

Water New Zealand, 2023. Water, September October Issue 231

Attachment A: What is an On-site wastewater management system?

Note: words in italics are extracted from the source document; bold has been added for emphasising a point.

1. Definitions from nationally used documents.

AS/NZS 1547: 2012

> **On-site system** *An on-site domestic wastewater management system that receives, treats, and* ***applies*** *wastewater to a* ***land application system*** *or a holding tank.*
>
> **Land Application System** *The system used to apply effluent from a wastewater treatment unit into or onto the soil for further in-soil treatment and absorption or evaporation.*

MfE 2008 *On-site wastewater systems provide treatment of domestic wastewater and return it to the environment within the boundaries of the property of origin.*

Auckland Council TP 58 2004*: The collection, treatment, and disposal /reuse of wastewater from an individual home or commercial facility on the same property as it is generated.*

MfE 2003 *small-scale domestic wastewater system comprising the technologies and management protocols for the appropriate handling of household wastewater within the property boundaries of the place of origin of the wastewater.*

2. Definitions from some regional plans.

Environment Southland 2017

On-site Wastewater System. The collection, treatment and disposal/reuse of wastewater from an individual home or commercial facility on the same landholding as it is generated.

Otago Regional Council 2015

On-site wastewater treatment system. Any system, such as a septic tank, designed to treat household liquid effluent including sewage within the boundary of the property on which the effluent was generated, and includes the treatment system and any attached disposal field.

Bay of Plenty Regional Council 2014

On-site Effluent Treatment System – - An on-site domestic wastewater management system that receives, treats and applies wastewater to a land application system or a holding tank.

Land Application System – The system used to apply effluent from a wastewater treatment unit into or onto the soil for further in-soil treatment and absorption or evaporation.

3. Definitions from other sources.

Building Act 2002

An on-site system could be interpretated as part of building under the meaning of a building, s8. ie

8 Building: what it means and includes

(1) In this Act, unless the context otherwise requires, building—

> *(a) means a temporary or permanent movable or immovable structure (including a structure intended for occupation by people, animals, machinery, or chattels); and*
>
> *(b) includes—*
>
> > *(i) a mechanical, electrical, or* ***other system****; and*
> >
> > *(ii) any means of restricting or preventing access to a residential pool; and*
> >
> > *(iii) a vehicle or motor vehicle (including a vehicle or motor vehicle as defined in section 2(1) of the Land Transport Act 1998) that is immovable and is occupied by people on a permanent or long term basis; and*
> >
> > *(iv) a mast pole or a telecommunication aerial that is on, or forms part of, a building and that is more than 7 m in height above the point of its attachment or base support (except a dish aerial that is less than 2 m wide); and*
>
> *(c) includes any 2 or more buildings that, on completion of building work, are intended to be managed as one building with a common use and a common set of ownership arrangements; and*
>
> *(d) includes the non-moving parts of a cable car attached to or servicing a building; and*
>
> *(e) after 30 March 2008, includes the moving parts of a cable car attached to or servicing a building.*

(2) Subsection (1)(b)(i) only applies if—

> *(a) the mechanical, electrical, or* ***other system is attached to the structure*** *referred to in subsection (1)(a); and*
>
> *(b) the system—*
>
> > *(i) is* ***required*** *by the building code; or*
> >
> > *(ii) if installed, is required to comply with the building code.*

(3) Subsection (1)(c) only applies in relation to

> *(a) subpart 2 of Part 2; and*
>
> *(b) a building consent; and*
>
> *(c) a code compliance certificate; and*
>
> *(d) a compliance schedule.*

Discussion document: Drinking Water and Wastewater Network Environmental Performance, Taumata Arowai, 2022?

The Discussion document states *The Act (*Water Services Act 2021*) defines a wastewater network as the infrastructure and processes that are used to collect, store, transmit through reticulation, treat, or discharge wastewater that are operated by, or on behalf of a wastewater network operator. This means the definition of a wastewater network is very broad and captures small wastewater systems, such as on-site wastewater systems (where they are operated by a network operator such as a council).* On site systems are included.

The meaning of wastewater network operator in the Act (as at 17 February 2024) is—

(a) each of the following, to the extent that they operate a wastewater network or supervise its operation or aspects of its operation:

> *(i) a local authority, council-controlled organisation, or subsidiary of a council-controlled organisation:*
>
> *(ii) a department:*
>
> *(iii) the New Zealand Defence Force; and*
>
> > *(b) any person who operates a wastewater network, or any aspect of a wastewater network, for, or on behalf of, an organisation specified in paragraph (a); and*
> >
> > *(c) an organisation or individual involved in the operation of a wastewater network if the organisation or individual is authorised or included on a register in accordance with regulations made under section 200*

Given the meaning, most wastewater systems (ie OWMSs) will not be covered by the Act.

Attachment B: Sanitary Works Subsidy Scheme

The Sanitary Works Subsidy Scheme started on 1 July 2003 and ran for 10 years approximately.

The scheme was largely targeted at helping deprived communities with septic tank problems, caused by small sections and poor drainage conditions.

Most applications were approved for subsidy.

Most of the early schemes that were approved involved conventional sewerage reticulation. Still, some communities could not afford to implement sewerage schemes, even with a high rate of subsidy.

Attachment C: On-site Wastewater Management Systems (OWMS) Workshop Summary Document, 3 May 2021 – Palmerston North

13. IDENTIFICATION OF KEY ISSUES – GROUP DISCUSSION

This section of the report compiles the agreed key issues as summarised in the presentation edited during the group discussion, and also includes further issues as identified during the questions after each presentation, and the information from the poster notes.

1) DESIGNERS
Training of designers
Site investigation training
Designer accreditation

2) SYSTEM SUPPLIERS
Ongoing Operation and Maintenance responsibility
Designer compliance with supplier specifications
Warranty on system components
National standard
Homeowner accountability and education.

3) INSTALLATION AND MAINTENANCE
Homeowner/occupier education
Councils enforcing compliance.
Record keeping: resource consent, O&M/information on property files and LIM
Connect with Real Estate NZ, NZ Law Society

4) IRRIGATION
Durability and performance

5) REGULATORS
Lack of training for council staff
Council compliance enforcement
Common approach to compliance, and O&M
WOF for OMWS under the building act.
Resourcing for monitoring
Address PA vs consent due to high costs of consenting.
Policy changes
Development pressure

6) OSET-NTP
More consultation needed.
SWANS-SIG videoconference meeting to decide way forward – all stakeholders invited in June, prepare an agenda etc. 2- hours.
Need central government engagement (MfE, MBIE)
Industry group agreement on testing requirements and conditions
Local and central government funding needed.

7) TRAINING
Training programme being revised.
Need expert level training and career development.
Servicing and accreditation
Training programme for servicing and installers/agents
Soils classification training

8) END-USER
No consistent approach to rules etc. throughout NZ, difficult to manage for national body.
Support OSET-NTP and an OSET NES.
Expect more rigorous oversight.
Varied standard of designers

9) RESEARCH
Soil provides significant additional treatment.
Matauranga Maori included in treatment design.
Field testing of on-site system for groundwater quality underway in Canterbury

10) PUBLIC HEALTH
Fix problems with existing communities

- Public health evidence.
- Community wants versus health needs.

Reticulation negatives – still effects of discharges, loss of character/changes to intensity of development, other pollutants. Tikanga aspects of moving contaminants.
Some processes are too hard to comply with especially when looking at simple upgrades.

11) REGULATORY REFORM
Central government not interested in on site wastewater at present.
Permitted activity monitoring – change Acts to provide ability for RC to recover costs.
Lobby central government for a central agency to have oversight for OWMS, including research funding and testing funding.