Scalability of Advanced Passive Wastewater Systems[1]

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[1] Version V3 27/3/2020

1. Summary

The introduction of AS1546.3:2017 into most Australian states at the end of 2020, will require all secondary treatment systems (STS) to be tested over a 42-week test period, require a minimum hydraulic wastewater load of 1,200 L/d without any opportunity for design scalability.

This is a 'one size fits all' (1,200 L/day) approach fails to address the ability of passive systems to reliably treat smaller daily loads.

Review of USA, Canada and Europe regulations and systems, indicates that:

- Scalability is allowed for the Advance Enviro-Septic (AES) system in the USA. Twenty Five States require a minimum size of either one or two bedrooms, with the remaining states using NSF 40 Class 1 Approval which allows systems from three to ten bedrooms. The original testing for the NSF standard was for three bedrooms with the remaining approvals scaled from the original test data.

- Canada allows for scalability with the AES system which is discussed in Section 4.4.

- France allows for scalability with the AES System which is discussed in Section 4.5.

- New Zealand allows for scalability with the AES System which is discussed in Section 4.6.

In excess of 250,000 Presby AES systems have been installed in the USA[2], with more than 15,000 systems in Canada and more than 5,000 in Europe. New Zealand[3] have installed over 805 domestic and 14 large commercial systems. Australia has over 4,050 systems with around 230 commercial systems. All of these systems have used scalability in design. Many systems are designed for between one and six bedrooms, they work exceptionally well with the average being a three bedroom system.

Standards Australia, in developing and releasing AS1546.3:2017, are contradicting worldwide acceptance of a scalable passive effective wastewater treatment in requiring a minimum flow of 1,200 L/d with NO SCALABILITY allowed.

Neither logical nor technical reasoning has been forthcoming to validate removal of scalability, other than "*below this level (8EP) the treatment process can quickly become inefficient and unable to survive the stress tests*."… *"NSW Health abandoned accreditation of treatment systems of less than Ep8 many years ago.*" [4] (EP8 being 1,200 L/d) There is therefore an unsubstantiated requirement for passive systems to be sized at a large, excessive minimum daily flow to that which occurs in reality.

The implications for passive systems is that the introduction of AS1546.3:2017 will result in a waste of resources, significantly larger systems than required that will not fit onto a homeowner's land and an economic hit to everyday consumers. Many smaller land blocks will only be able to remove effluent off site via expensive wastewater pump outs that in many jurisdictions are prohibited. This outcome is clearly not acceptable and the standard must either be rescinded or corrected.

2. Introduction

AS1546.3:2017 states that NO Sewage Treatment System (STS) are allowed to be scaled up or down. "*STS's that are tested on the basis of alternative test protocols, or use theoretical calculations or modelling of larger or smaller sized systems cannot claim to conform with this standard."* [5]

"*STS's that meet the product conformity requirements in this standard shall be available for retail sale, as a standardised manufactured unit assembled either in factory or in the field.*" [6]

The WS040 committee, that drafted AS1546.3:2017, have stated that "*European, USA and Canadian Standards do not allow theoretically based smaller systems to be accredited without full testing and*

[2] USA as of 2015
[3] NZ as of March 2020
[4] Email Standards Australia to WS040 Committee Comment from WS040 AS1546.3:2017 7/8/19
[5] AS1547.3:2017 Section 1.2 Inclusions Paragraph 3
[6] AS1547.3:2017 Section 1.2 Inclusions Paragraph 4

validation, as the smaller the hydraulic capacity of the system, the more likely it is to fail."[7] No evidence is forthcoming to validate such an assertion.

This report will look at International standards and countries that do allow scalability for passive systems and how AS1546.3:2017 deliberately prevents competition, which breaches both local and world trade agreements.

3. Scalability in Australia

Scalability of wastewater systems and land application area (LAA) in Australia has been permitted for passive systems under AS/NZS1547:2012 up until the adoption of the new AS1546.3:2017. This new standard will come into effect in most Australian States at the end of 2020.

Once this standard is introduced, there will be no scalability allowed and every system must be designed and tested for a minimum of 1,200 L/d along with the LAA sized for this minimum flow. Every system designed above 1,200 L/d must be tested to this standard, incurring a cost of around AU$107,500 including GST per test.[8]

Assuming testing has been completed for the 1,200 L/d system, then complying to this standard would require a new 42-week test for 1,250 L/d or greater daily flows depending on the hydraulic load for which accreditation was required. This field validation is obviously impractical for most, and impossible for other passive systems as there is an infinite number of combinations of daily wastewater load, soil properties, climatic variables and lot restrictions.

Water resources in Australia are limited seasonally and regionally, with many on-site systems restricted to rainwater sources. Even though a homeowner decides to treat and reuse greywater using WaterSmartTechnologies, such diversions would still require an STS rated at a minimum 1,200 L/d. Such intent is absurd.

Using AS/NZS1547:2012, greywater usage is 90L/p/d with blackwater 60 L/p/d on town water supply. This separation would mean a blackwater system designed for the average Australian household of five people would only require a 300 L/d blackwater treatment system. AS1546.3:2017 would increase that to 1,200 L/d, a ridiculous increase of 400% above what is required. The economic consequences are bewildering!

The introduction of AS1546.3:2017 will result in an unnecessary waste of resources, significantly larger systems that will not fit onto the homeowner's land and everyday significantly skewed cost/benefit outcome for the worse. Many smaller land blocks will only be able to remove effluent off site via expensive wastewater pump outs. That many local authorities prohibit pump-outs will render some lots uninhabitable until sewered options are available. (Should that be economically viable)

4. Wastewater Systems & Standards in Other Countries

4.1. General

Canada, USA, Europe and NZ each allows scalability for passive systems, such as the Presby AES system. Approvals are either by individual state agreements or referral to the NSF/ANSI 40 Class 1 approval for various model sizes, BNQ NQ-3680-910 Class II & III or NF-EN 12566.6. Australia and New Zealand currently design systems to AS/NZS1547:2012 which also allows scalability.[9]

Hydraulic daily wastewater design load in these countries is higher than Australia and New Zealand. Most USA states allow around 570 L/bedroom (BR) which is significantly higher than 300 L/d in Australia for a 1BR home. Sydney water require an on-site system designed for 300 L/d for each bedroom, irrespective of size of dwelling.[10] Other authorities suggest a decreasing occupancy for increasing bedrooms.

[7] "Feedback on Proposal to amend AS1546.3:2017 with additional background" Page 2 Item 4
[8] Section 8 Appendix 2. STP Compliance Testing Costing
[9] Refer to Sections 4.3.2, 4.3.3 4.4.2 4.5.2 4.6 4.7 for detailed references
[10] "Designing and installing on-site wastewater systems" WaterNSW, V2 November 2019 Page 15

4.2. Presby Environmental

The Advanced Enviro-septic system was developed by David Presby of Presby Environmental in 1995. Presby saw a need for a simple effective environmentally sustainable wastewater treatment system that would replace failing septic systems.

The AES is a 3m long by 300mm diameter pipe with ridges and skimmer tabs to aid in stripping solids whilst cooling the effluent. A bio-accelerator geo-textile mat that surrounds the bottom third of the pipe acts as a bio-mat whilst the pipe is wrapped in plastic fibres with a black geo-textile outer layer.

The pipes are installed in various arrangements, depending on site and soil constraints and are laid in a sand bed that meets ASTM C-33 Fine Aggregate specifications.[11] The system is aerobically vented using differential air vents and wastewater is discharged to the surrounding sand as a highly purified effluent.

This system has now become the world's most practical and effective wastewater treatment system providing a clean, green alternative to traditional septic tank drainfield systems. The system is now approved and operating in over 14 countries around the world.

4.3. USA

Presby AES in the USA use both State Agreements and NPI/ANSI testing. The state agreements are scalable from one bedroom up to around ten. The NPI/ANSI 40 Class 1 approved systems are from three to ten bedrooms. Presby have well over 250,000 systems installed in the USA, with some operating since 1995.

The following Sections 4.3.1 to 4.3.3 detail on-site systems and state approvals for both agreements and NSF standards.

4.3.1. Number of Onsite Systems USA

According to EPRI, the predicted number of onsite wastewater systems in the USA in 2015 was 34,678,000. This scenario is shown in Figure 1. Many of these systems would be the old-style septic tanks with AWTS and advanced passive systems making up the remainder.

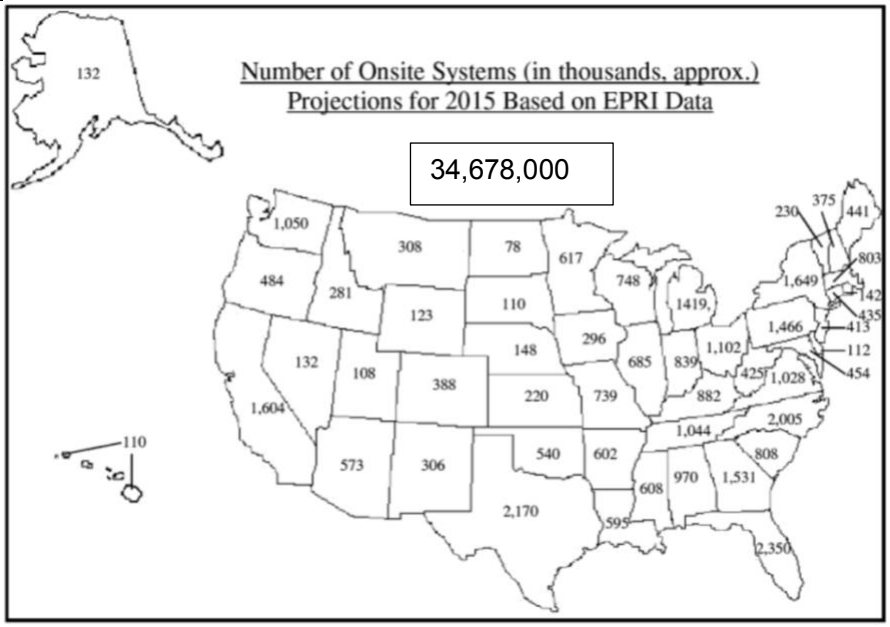

Figure 1 EPRI Projected number onsite domestic systems for 2015[12]

4.3.2. State Agreements

The states, shown below in Figure 2, have specific agreements to allow design & installation of Presby AES systems.

[11] ASTM C33 Specification for Concrete Aggregates. Fine Aggregate

[12] "Advanced Onsite Wastewater Systems Technologies" Jantrania, A, Gross, M 2006, Page 4

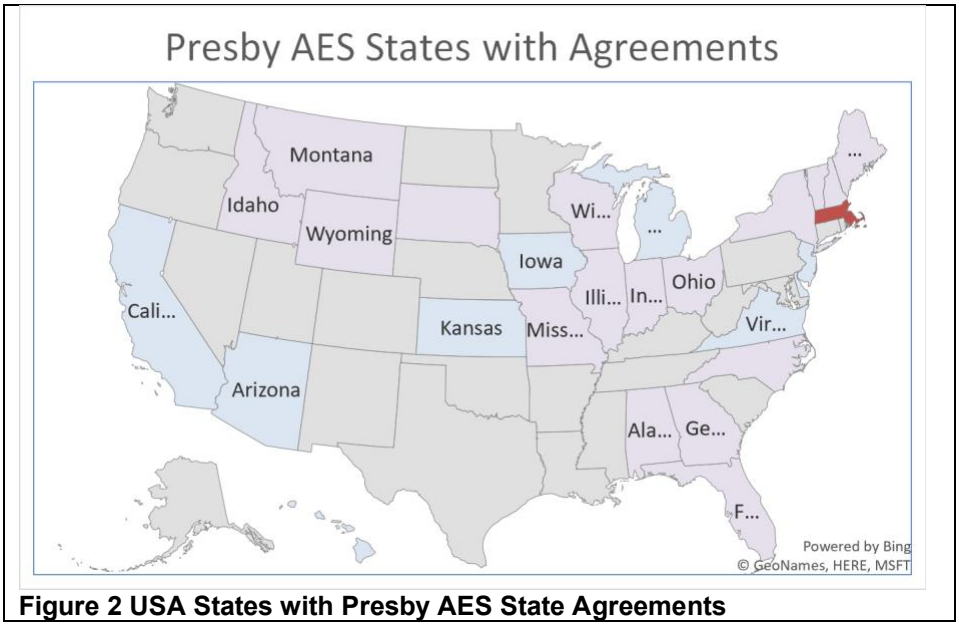

Figure 2 USA States with Presby AES State Agreements

These agreements include the minimum size and the hydraulic load allowance per bedroom per day and are listed for each State in Table 1.

Table 1 Minimum size and hydraulic load per bedroom USA State Agreements

State	Minimum Bedrooms	Hydraulic Load/Bedroom
Alabama	2 BR	570 L/BR
Arizona	1 BR	570 L/BR
California	1 BR	570 L/BR
Delaware	1 BR	450 L/BR
Florida	2 BR	380 L/BR
Georgia	2 BR	570 L/BR
Hawaii	Not Stated	
Idaho	2 BR	380 L/BR + 190 L/BR > 2BR
Illinois	2 BR	570 L/BR
Indiana	2 BR	570 L/BR
Iowa	1 BR	570 L/BR
Kansas	1 BR	570 L/BR
Maine	2 BR	340 L/BR
Massachusetts	3 BR	420 L/BR
Michigan	Not Stated	
Missouri	2 BR	450 L/BR
Montana	2 BR	
New Hampshire	2 BR	570 L/BR
New Jersey	1 BR	570 L/BR
New York	2 BR	570 L/BR for 2BR, 1,260 L 3BR, 1,680 L 4BR
North Carolina	2 BR	450 L/BR MIN 1,135 L
Ohio	2 BR	450 L/BR MIN 1,135 L
South Dakota	2 BR	570 L/BR
Vermont	2 BR	1,060 L 2BR 1,590 L 3BR
Virginia	1 BR	570 L/BR
Wisconsin	2 BR	570 L/BR
Wyoming	2 BR	570 L/BR
AVERAGE	**1.8 BR**	

Metcalf & Eddy (2014) indicate that typical wastewater flowrates in the USA per person are generally lower per bedroom compared to the state-based requirements of 570 L/BR/D or 150 US Gall/P/D.

These flowrates are shown below in Table 2. Using extensive conservation from Metcalf & Eddy (2014) would result in a daily flow of 560 L/d for one bedroom (based on two persons at 280 L/p/d) with a sliding scale after that.

Table 2 Typical Wastewater Flowrates USA Metcalf & Eddy, 5th Edition 2013 data

Table 3–2
Typical wastewater flowrates from urban residential sources in the United States

Household size, no. of persons	Flowrate, gal/capita·d		Flowrate, L/capita·d	
	With current level of conservation	With extensive conservation	With current level of conservation	With extensive conservation
1	103	74	390	280
2	77	54	290	205
3	68	48	257	180
4	63	44	240	168
5	61	42	230	160
6	59	41	223	155
7	58	40	218	151
8	57	39	215	149

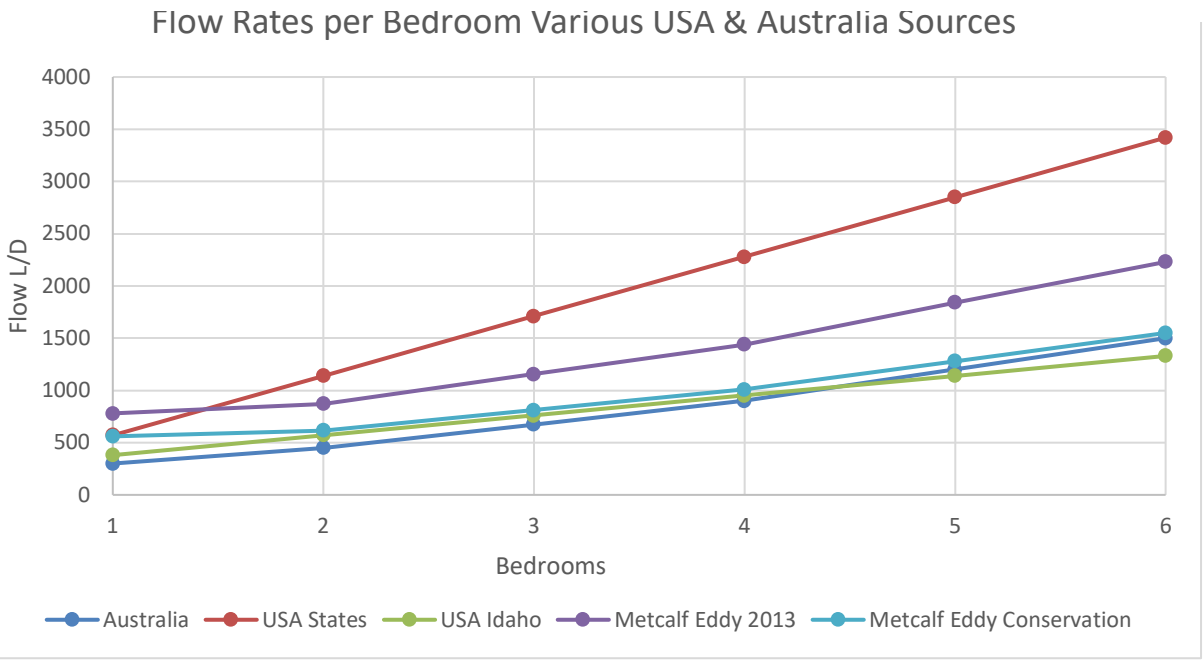

Figure 3 Comparison of Household Wastewater Flowrates USA Metcalf & Eddy & Australia

As detailed in Table 1, 68% of the USA require a minimum wastewater flow allowance of two bedrooms. Twenty eight percent have a minimum planning requirement for one 1 bedroom while one state requires three bedrooms as a minimum for design purposes.

Figure 3 compares the majority of USA states to Metcalf & Eddy (2014), along with Australia (AS/NZS1547:2012) and Idaho, calculating the daily flow based on bedroom loading. Australia and US State Idaho are very similar whilst the majority of USA states & Metcalf & Eddy (2014) use a much higher hydraulic loading rate. Extensive Conservation hydraulic loads (Metcalf & Eddy 2014) are similar to Australia and Idaho.

The USA use significantly more water per person than Australia, however the principle of scaling is still relevant.

Based on USA State requirements, the AES system IS LEGALLY SCALEABLE with sizing varying from one to ten bedrooms.

4.3.3. NSF/ANSI Standards 40 Class 1

The remaining states, without specific agreements, approve the AES system based on the NSF/ANSI Standard 40 Class 1. (2009)

Based on USA State requirements, the AES system IS LEGALLY SCALEABLE with sizing varying from three to ten bedrooms.

The Presby AES was originally tested to NSF 40 Class 1 for three Bedrooms. (450 g/d or 1,700 L/d) The approvals for the remaining 4 to 10 bedrooms were approved and SCALED by a certified engineer, approved by the NSF. This is shown in Section 7 Appendix 1 Approval Documents on Page 14.

The map shown in Figure 4 shows the 21 USA States that use NSF Standard 40 Class 1.

Based on USA NSF 40 Class 1 approvals, the AES system IS LEGALLY SCALEABLE with size varying from three to ten bedrooms.

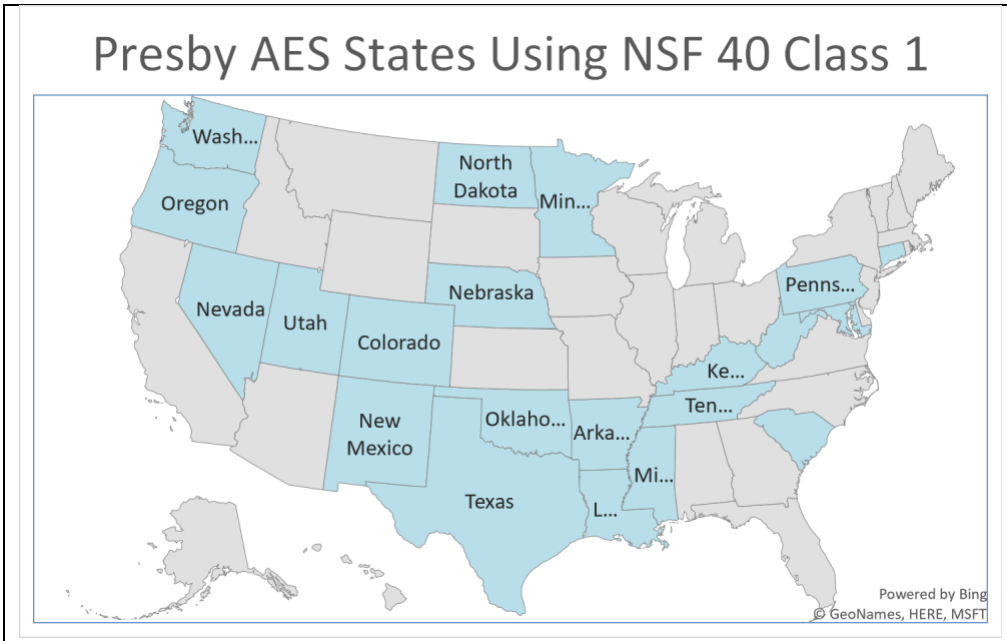

Figure 4 USA Presby States Using NSF 40-1

4.4. Canada

The AES system is certified in Canada under the Bureau de Normalisation de Quebec (BNQ) NQ-3680-910. "DBO Expert" is the company that distributes the AES System in this and other regions.

Model AES-TS is certified to Class II Secondary Treatment Level.
Model AES-TSA is certified to Class III Advanced Secondary Treatment.

4.4.1. Number of On-site Wastewater Treatment Systems in Canada

The Census in 2011 noted that[13]:

- The proportion of centralised sewer households was 80%.
- The proportion of on-site domestic wastewater systems was 14%.
- The number of households was 13,320,615.
- The number of on-site domestic wastewater systems was 1,864,886.

4.4.2. Canada State Approvals

The AES system is approved in seven out of eleven states and is scalable from one to twenty bedrooms. These Canadian states are shown in Figure 5.

[13] "Canadian Households in 2011: Type & Growth" Statistics Canada, 2011 Census in brief

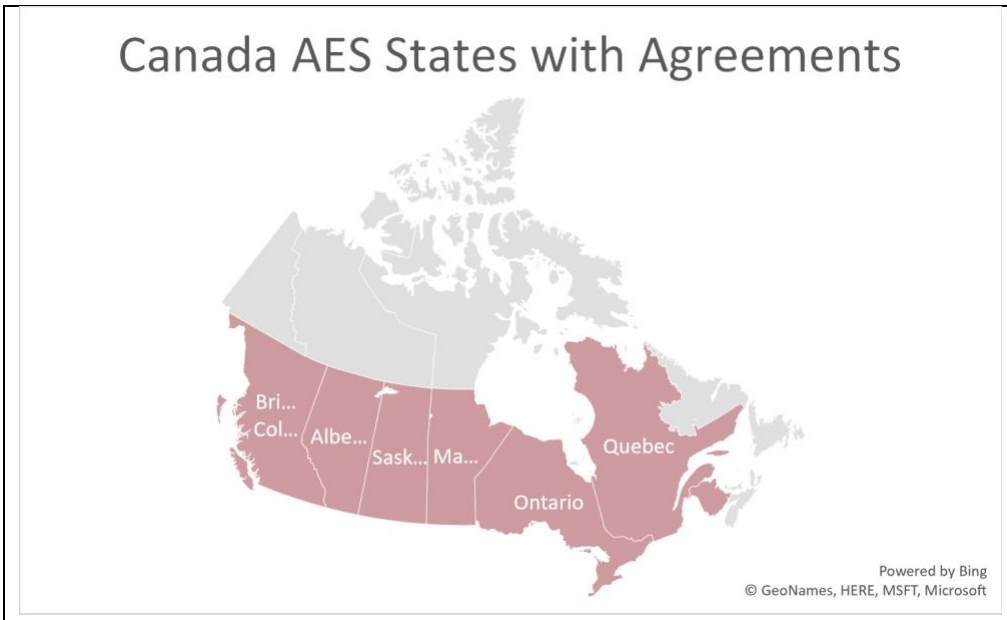

Figure 5 Canadian AES State Approvals (coloured red)

Table 3 details the maximum hydraulic load per number of bedrooms in Canada.[14]

Table 3 AES Hydraulic Capacity based on House Bedrooms

Table 1 – Enviro-Septic hydraulic capacity based on the number of bedrooms of an isolated dwelling

Number of bedrooms	Minimum Number of Advanced Enviro-Septic® Pipes (3.05 m each)	Minimum Total Length of Advanced Enviro-Septic® Pipes (m)	Maximum Hydraulic Capacity (L/d)[3]
1	8	24,4	540
2	12	36,6	1080
3	15	45,8	1260
4	18	54,9	1440
5	22	67,1	1800
6	26	79,3	2160

The values from Table 3 are depicted in Figure 6.

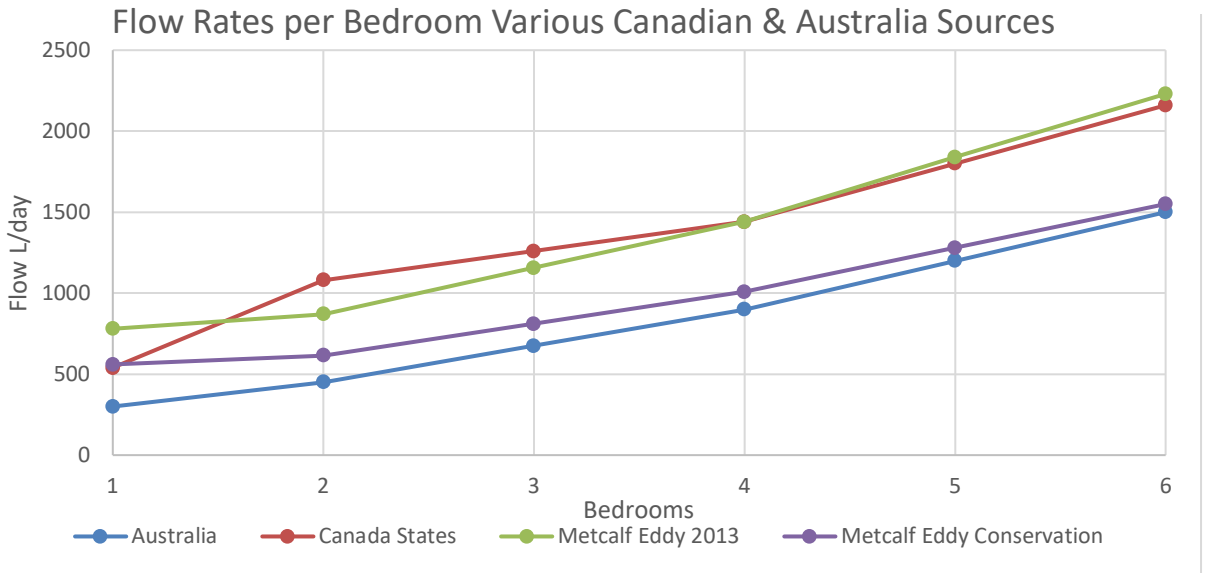

Figure 6 Flow Rates per Bedroom for Various Canadian & Australian Sources

[14] "Enviro-septic System Guide, AES TS Model & AES-TSA Model" DBO Expert Version 2.2.3 8th July 2013

Figure 6 compares the majority of Canadian states to Metcalf & Eddy (2014) along with Australia. (AS/NZS1547:2012) The daily flow is based on bedroom loading. Australia is significantly lower than Canada, however similar to Metcalf & Eddy (2014) extensive conservation hydraulic loads.

Canada use significantly more water per person than Australia, as does the USA, however the principle of scaling is still relevant.

Based on Canadian State requirements, the AES system IS LEGALLY SCALEABLE with sizing varying from one to nine bedrooms. (Maximum household hydraulic daily load 3,260 L/d)

4.5. France

The AES system is certified in France to Standard NF-EN 12566-6[15] for 5-20 EP, where 1EP=180 L/p/d.

The green list of insurance C2P[16] who have established that the Enviro-septic is without risk for insurance purposes. This green list defines Enviro-septic as a safe technology for professional sanitation and users/customers.[17]

4.5.1. Number of On-site Wastewater Treatment Systems in France

Eurostat data[18] indicate that in 2017, France had 80% of the population connected to a centralised mains sewer with around 20% using on-site wastewater systems.

The French Population in 2020 noted that[19,20]:

- There were 65,225,221 people in 2020
- The proportion of centralised sewer households was 80%.
- The proportion of on-site domestic wastewater systems was 20%[21].
- The number of households in 2018 was 29,802,900.
- The number of on-site domestic wastewater systems based on surveys was 5,960,580.

4.5.2. French Approvals

The AES System is approved in France from 5EP to 20EP.[22] (900-3,600 L/d)

The design daily wastewater flow in France is based on the number of people. The design daily flow rates for France, for USA (Metcalf & Eddy (2014)) and Australia are shown in chart form in Figure 7.

15 Journal official de la republiue francaise – No 234 du 12 Juin 2019
16 Dossier-Technique-infiltration.fr.en
17 "Advanced Enviro-septic technical file". DBOExpert France Page 4
18 https://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=sdg_06_20
19 https://worldpopulationreview.com/countries/france-population/
20 https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Private_households_by_household_composition,_2008-2018_(number_of_households_in_1_000_and_%25_of_household_types).png
21 https://ec.europa.eu/eurostat/tgm/refreshTableAction.do?tab=table&plugin=1&pcode=ten00020&language=en
22 "Notice of approval of secondary treatment systems for domestic wastewater & corresponding data sheets" Department of Environmental transition & Solidarity, 12th June 2019 2019-001-ext01-20

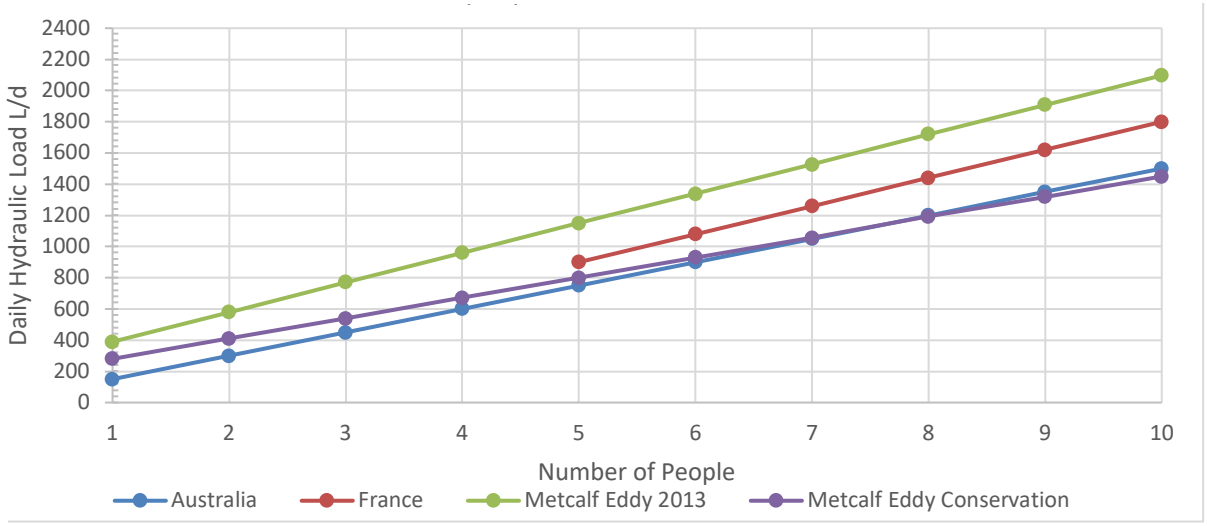

Figure 7 Design flow rates per person France, Australia and Metcalf & Eddy

This chart compares the daily hydraulic load per person for France to Metcalf & Eddy (2014) along with Australia as setout in AS/NZS1547:2012. The daily flow is based on person loading. Australia is slightly lower than France, however France have a minimum of 5 EP. Metcalf & Eddy (2014) have similar daily flows to Australia using Extensive Conservation.

France use scaling to size the AES system.

Based on France requirements, the AES system IS LEGALLY SCALEABLE with sizing varying from 5 to 20 persons.

4.6. New Zealand

4.6.1. General

New Zealand refused to be joint partners with Standards Australia to develop AS1546.3:2017. New Zealand is very similar to Australia, the USA, France and Canada as they also allow for scalability.

Similar to Australia, New Zealand has eight regional councils that have wastewater rules for design and installation. New Zealand allow systems sized from one bedroom (2 persons) to a maximum of 2,000 L/d.

4.6.2. AES in New Zealand

In 2013, Environment Technology started supplying and installing AES systems in New Zealand. Since then, they have installed over 805 domestic and 14 large commercial systems have been installed.

4.6.3. Design Daily Flows

New Zealand generally use the following daily flow allowances for new installations of 165 L/p/d town water and 145 L/p/d tanks water on new builds. The design flows are shown in Table 4.[23]

Table 4 Daily Flow Bedrooms

BR's	People	Daily Flow Town Water	Daily Flow Tank Water
1	2	330 L/d	290 L/d
2	4	660 L/d	580 L/d
3	5	825 L/d	725 L/d
4	6	990 L/d	870 L/d
5	8	1,320 L/d	1,160 L/d
6	9	1,485 L/d	1,305 L/d

[23] "On-site Wastewater Systems: Design & Management Manual" 3rd Ed ARC Technical Publication 2004

Comparing the town water flow to Australia is shown in Figure 8

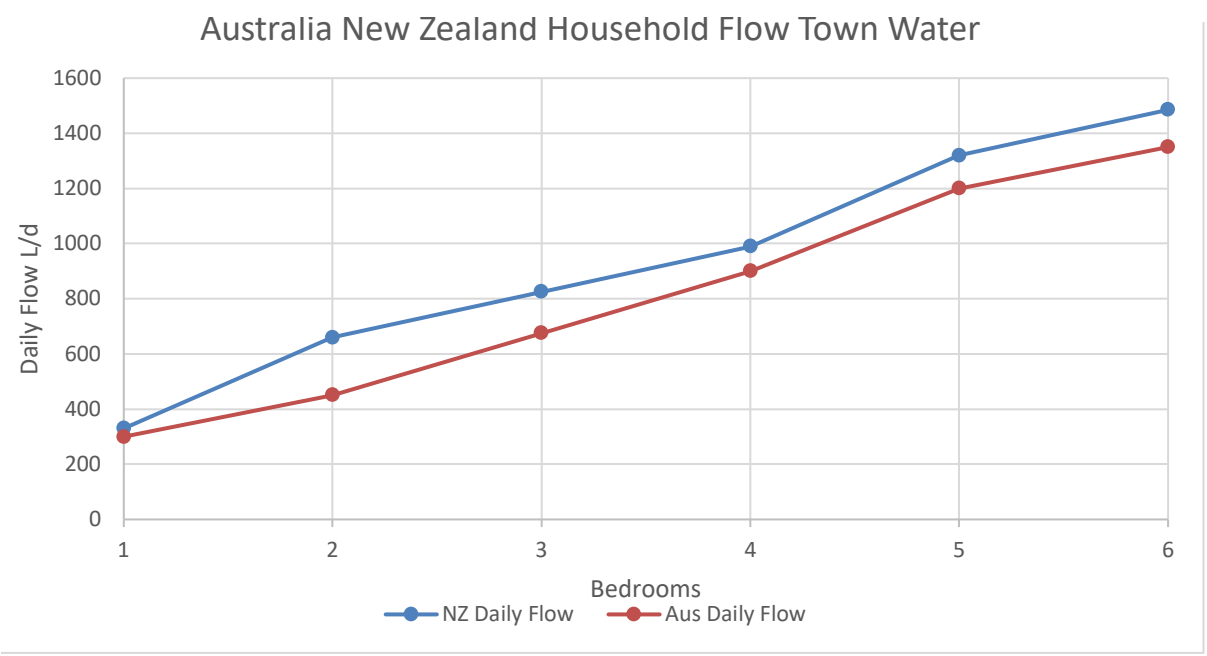

Figure 8 Australian New Zealand Daily household flow

The New Zealand daily flow can be higher than shown in Figure 8. For example, a retro fit to an older house the designer would use 200 L/p/d. This is a 20% increase compared to new installations.

The Australian and New Zealand daily rates are similar; however, Australia has a lower allowance per person due to the harsh climate and water efficiency measures mandated over the last 20 years with particular reference to BASIX in NSW. Both Australia and New Zealand are significantly lower than the USA, Canada and Europe.

Based on New Zealand requirements, the AES system IS LEGALLY SCALEABLE with sizing varying from one bedroom to 2,000 L/d.

4.7. Australia

Scalability in Australia has been allowed for under AS/NZS1547:2012 for primary and secondary systems but not allowed for secondary systems in AS1546.3:2017 once instigated.

4.7.1. Number of on-site systems in Australia

The distribution percentage of on-site wastewater systems was obtained from O'Keefe 2001[24] is shown in Table 5. The number of households in Australia was obtained from the 2016 Census and this is also shown in Table 5.

Table 5 Australian On-site Wastewater Systems

State	% On-site Systems	Households	# On-site Systems
QLD	20.0%	1,987,313	397,463
NSW	15.0%	3,059,599	458,940
VIC	16.5%	2,520,912	415,950
TAS	38.0%	241,744	91,863
SA	16.0%	765,786	122,526
NT	16.0%	89,959	14,393
WA	21.0%	1,070,962	224,902
ACT	0.2%	163,286	327
TOTAL		**9,899,561**	**1,726,363**

[24] Septic Absorption Trenches: Are they Sustainable?" Beal C, Gardner E, Menzies N, Water February 2005

In 2016, Australia had approximately 1,726,000 on-site domestic wastewater treatment systems.

4.7.2. Daily Design Flows

Depending on the local council, secondary passive systems range from one bedroom to six or maximum 14,000 L/week (10EP). The average house size in Australia is just over three bedrooms.[25]

Australia has always had scalability for passive wastewater systems but will be removed once AS1546.3:2017 commences, in most states, at the end of 2020.

4.8. World

Presby AES now supply passive wastewater treatment systems to over 14 countries across the world. Currently, all countries allow engineering scaling for each design. Australia, at the end of 2020, will have scalability removed, therefore removing an environmentally sustainable and extremely effective treatment system from the market. The countries are shown in Figure 9.

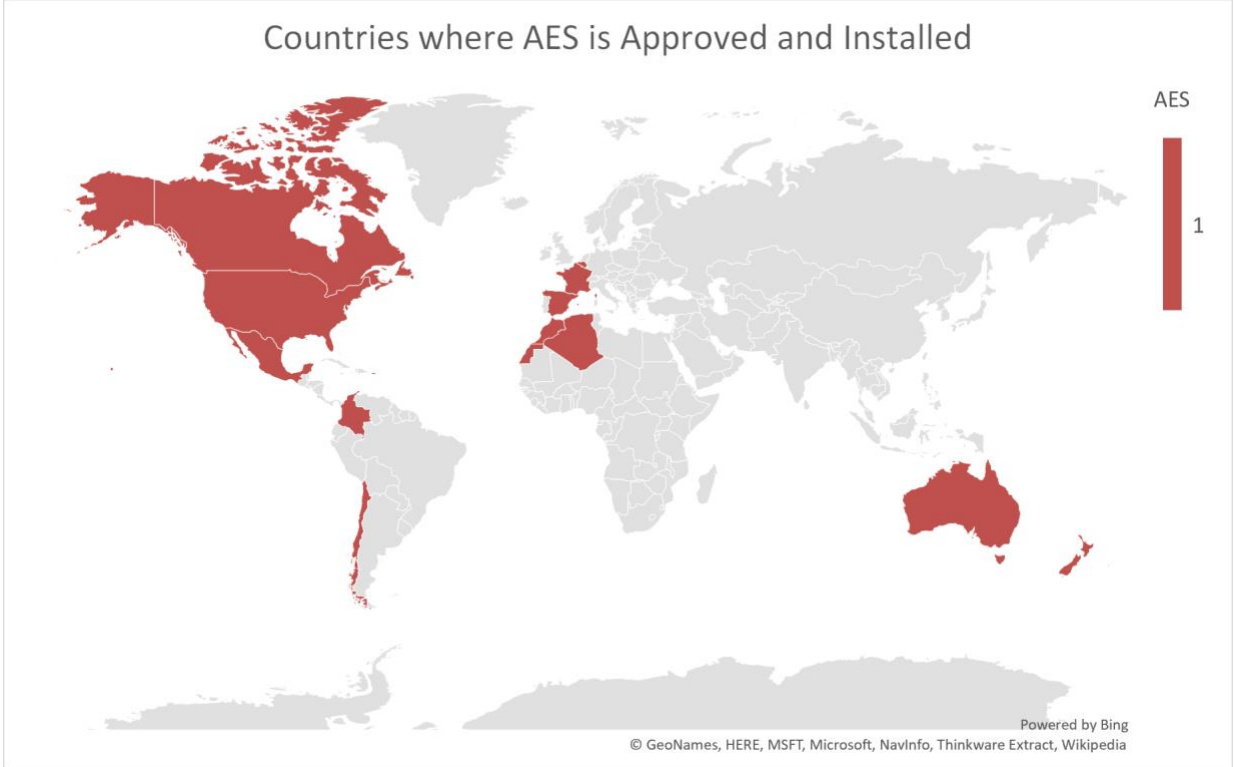

Figure 9 Countries where the AES is Installed (Not Specific States)

The question must be asked and answered as to why this exclusion been allowed to happen and further is supported without any clear evidence as to why terminal treatment in the field can be achieved commensurate with the objectives of the Standard.

It is clear that system performance to AS1546.3:2017 may achieve a level of treatment but at that level of treatment does not permit the release of effluent to the wider environment without consideration of the land application area. The AES considers the physical and biological properties of the land application are as part of the terminal process yet is excluded from the standard.

5. Conclusion

Over 14 countries in the World allow wastewater systems to be scaled to suit the domestic application. The fact that well over 270,000 AES systems have been installed proves that advanced scalable passive wastewater treatment systems can operate reliably and effectively.

Standards Australia, by approving an updated standard that removes scalability, are contradicting proven engineering practice and worldwide acceptance of a passive wastewater treatment system.

[25] ABS 2016 Data for average number bedrooms & people

There has been no logical technical reasoning given for this removal other than *"they do not work reliably at flows less than this"* (i.e. 1,200 L/day) even though they have been operating around the world since 1995.

Many other secondary treatment systems do not use an engineering system based on constant energy input in the form of aeration and pumping, and most rely on chlorination for disinfection.

The introduction of AS1546.3:2017 will result in wasted resources, systems that will not fit into a homeowner's land and an unnecessary economic impact on the consumers.

The question must be asked why passive systems are excluded. Failure of an adequate technical response can only mean the standard must be removed or corrected.

7. Appendix 1 Approval Documents

7.1. NSF/ANSI

Advanced Enviro-Septic™ (AES) Treatment Systems
Configuration Options & Comparisons

Please Note: *Advanced Enviro-Septic™ pipe from Presby Environmental is utilized in both NSF Standard 40 Models and in site-specific designs as allowed by State and/or Local approving authorities. NSF-40 testing of AES confirms effluent treatment and system reliability; however, State and/or Local regulations govern infiltration design considerations. The virtually unlimited design options of AES pipe made it impractical to submit all possible system configurations to NSF-40 testing protocols for Certification. The summary below highlights the major differences between AES Systems designed in accordance with State and/or Local regulations for a specific site and NSF-40 Certified Models constructed with AES pipe.*

Advanced Enviro-Septic™ Systems per State/Local Approvals (Visit website for current State Approvals: PresbyEnvironmental.com)	**NSF Standard 40 Class I Certified Advanced Enviro-Septic™ Systems Certificate No. 3U460-0 Issued 09/22/09**
State-Specific Configurations: No "models," site-specific designs by Certified Designers as approved by State or Local approving authorities Can be designed to accommodate any hydraulic design flow from 300 gallons per day up Bed or Trench sizes per State regulations All systems provide combined treatment and dispersal into underlying soils	**NSF-40 Certified Models Available:** CTD* 450 & SPD¤ 450 (three (3) bedroom) CTD* 600 & SPD¤ 600 (four (4) bedroom) CTD* 750 & SPD¤ 750 (five (5) bedroom) CTD* 900 & SPD¤ 900 (six (6) bedroom) CTD* 1050 & SPD¤ 1050 (seven (7) bedroom) CTD* 1200 & SPD¤ 1200 (eight (8) bedroom) CTD* 1350 & SPD¤ 1350 (nine (9) bedroom) CTD* 1500 & SPD¤ 1500 (ten (10) bedroom) * CTD Models are "bottomless" and provide combined treatment and dispersal ¤ SPD Models are constructed within an impermeable geomembrane liner, separate dispersal system required
Components and AES pipe sold separately Replacement systems can use existing septic tank if structurally sound No maintenance contract required	"System" must be purchased as a "package" that includes AES pipe, all required components (including septic tank, alarm, sampling port, distribution box, and geomembrane liner for SPD models) and a mandatory two-year pre-paid maintenance contract.
Trained/Certified Network of Designers and Installers; product available through local dealers/distributors	Available only through Authorized Representatives trained by Presby Environmental
Does not require electricity or alarms; some states require sampling/observation/inspection ports	Requires electricity, high water alarm, and sampling device
Systems can be designed in unique shapes (trapezoid, curved, angled, etc.) to adapt to site's topography and constraints. Can be used in bed or trench configurations Basic Serial, Combination, Multiple-bed and Distribution Box configurations	Systems are rectangular and installed in bed format using Distribution Box ("Parallel") Configuration only
Systems can be installed level or sloping (maximum site slope 33%, maximum system slope 25%, or as permitted by State approvals)	Systems must be installed level to within +/-½ inch
Component labels do not bear the NSF logo	Component labels bear the NSF logo
Residential, Commercial and Community applications (varies by State)	Residential Use ONLY
State-Specific Design and Installation Manuals provide information specific to the use of Advanced Enviro-Septic™ per State Approval.	**NSF-40 Certified Models utilize a distinct Installation Manual** available only to Authorized Representatives of Presby Environmental. Please call Customer Service at (800) 473-5298 for more information.

Figure 10 AES Treatment Systems State & NSF

8. Appendix 2. STP Compliance Testing Costing

Table 6 summarises costs involved in testing STP's to the new AS1546.3:2017.[26]

Table 6 Arris costing for testing

STS Testing for advanced secondary effluent compliance	Cost ex GST
Deposit to secure STS testing per unit	$20,000
On-site charge 10 months	$37,500
Compliance Reporting	$5,000
TOTAL Base Cost	$62,500

Table 7 cost estimate for transportation, installation, servicing and decommissioning.

Table 7 Estimated cost to supply, install, monitor and decommission

STS Installation & Monitoring	Cost ex GST
Transport to site	$3,000
Installation including system sand & septic tank	$10,000
Monitoring & servicing (4 weeks @ $800/day)	$16,000
Decommissioning & removal from site	$6,000
TOTAL Base Cost	$35,000

Total cost, assuming no disinfection testing, system failures or additional testing would be $97,500 plus GST. Total including GST would be $107,250.

[26] "On-site domestic wastewater treatment units secondary treatment systems SA1546.3:2017" Compliance testing expression of interest. ARRIS 26th July 2018