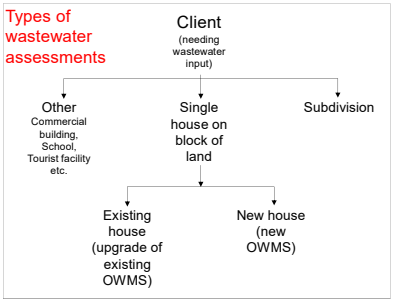
On-site Wastewater Management
Training Course

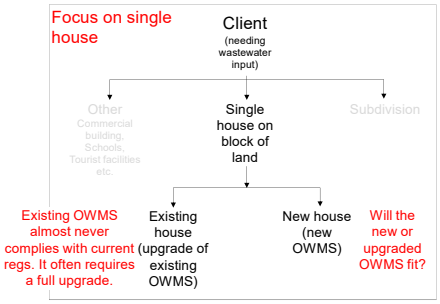
OWMSs: Traps and Tips for Designers

(Thoughts from a Tasmanian practitioner)

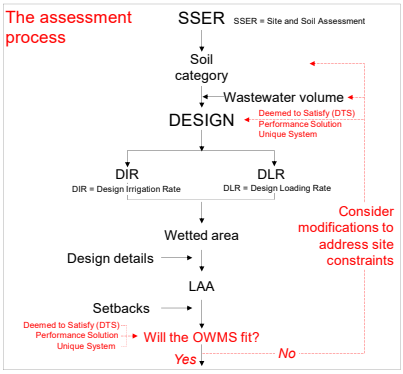
Types of wastewater assessments



Focus on single house

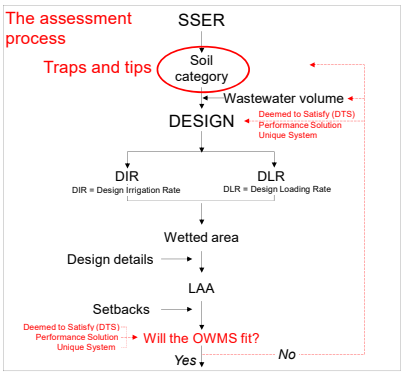


The assessment process

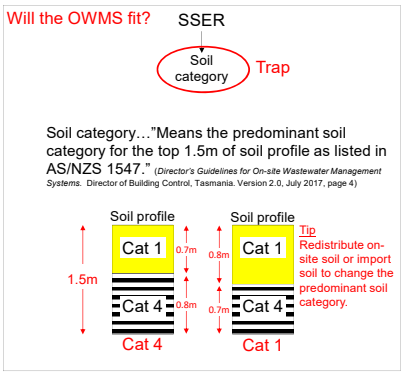


The assessment process

Traps and tips



Will the OWMS fit?



Soil category…"Means the predominant soil category for the top 1.5m of soil profile as listed in AS/NZS 1547." (*Director's Guidelines for On-site Wastewater Management Systems.* Director of Building Control, Tasmania. Version 2.0, July 2017, page 4)

Tip
Redistribute on-site soil or import soil to change the predominant soil category.

Will the OWMS fit? SSER

Traps and tips → Soil category

Extract from AS/NZS1547:2012 Table L1

Soil category	Soil texture	Structure	Indicative permeability (K_{sat})(m/d)
1	Gravels and sands	Structureless (massive)	> 3.0
2	Sandy loams	Weakly structured	> 3.0
		Massive	1.4 – 3.0
3	Loams	High/ moderate structured	1.5 – 3.0
		Weakly structured or massive	0.5 – 1.5
4	Clay loams	High/ moderate structured	0.5 – 1.5
		Weakly structured	0.12 – 0.5
		Massive	0.06 – 0.12
5	Light clays	Strongly structured	0.12 – 0.5
		Moderately structured	0.06 – 0.12
		Weakly structured or massive	< 0.06
6	Medium to heavy clays	Strongly structured	0.06 – 0.5
		Moderately structured	< 0.06
		Weakly structured or massive	< 0.06

Trap

Will the OWMS fit? SSER

Soil category → Trap

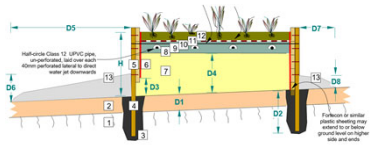
Failing OWMS (Southern Tasmania)

Will the OWMS fit? SSER

Soil category → Trap

Failing OWMS (Southern Tasmania)

Bottomless Sand Filter



Will the OWMS fit? SSER

Soil category → Trap

Failing OWMS (Southern Tasmania)

Will the OWMS fit? SSER

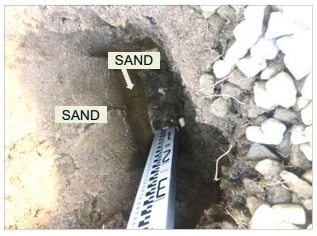
Soil category → Trap

Category 1 "SAND"

Will the OWMS fit? SSER

Soil category → Trap

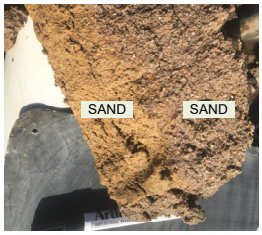
Category 1 "SAND"



Will the OWMS fit? SSER

Soil category → Trap

Category 1 "SAND"



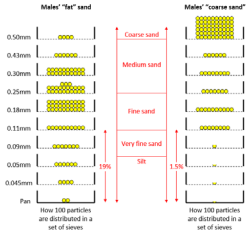
Will the OWMS fit? SSER

Soil category → Trap

Will the OWMS fit? SSER

Soil category → Trap

SAND and "SAND"

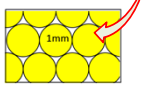


Will the OWMS fit? SSER

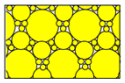
Soil category → Trap

SAND and "SAND"

SAND: very well sorted (one grain size); **relatively high permeability**; Category 1. Uniformity coefficient = 1



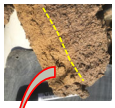
SAND with some silt: moderately sorted (several grain sizes); **relatively low permeability**; Category 5 or 6. Uniformity coefficient >6

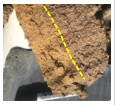


Will the OWMS fit? SSER

Soil category → Trap

SAND and "SAND"





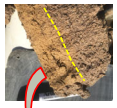
This so-called fat sand has 12% silt but no clay.
It's a true sand – not even a loam. **Its measured permeability is less than 0.02m/day.** This means it is Category 5 or 6 for sizing wastewater systems.

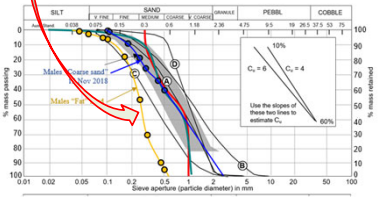
There are clear implications for designing OWMSs. Relying only on visual and/or tactile evidence to determine Soil Category could lead to serious undersizing.
Permeability too ought to be measured in the field.

Will the OWMS fit? SSER

Soil category → Trap

SAND and "SAND"





Will the OWMS fit? SSER

Soil category → Trap

SAND and "SAND"

Will the OWMS fit? SSER

Soil category → Traps and tips

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Trap and/or Tip

Will the OWMS fit? SSER

Soil category → Tip

1. As a risk mitigation approach to avoiding OWMS failure, assume that Category 6 and many Category 5 soils have effectively zero permeability for wastewater.

2. In these soils, consider a design with shallow distribution pipework so that wastewater is mostly lost upwards via evaporation (E) and evapotranspiration (ET).

3. In Tasmania, rates for E and ET range from about 1-2L/day/m² in winter, to 5 – 8L/day/m² in summer.

4. Use a DLR or DIR at the winter end of the scale. (If you size an OWMS on a summer E or ET scale, it will likely fail every winter.)

4	Clay loams	High/ moderate structured	0.5 – 1.5
		Weakly structured	0.12 – 0.5
		Massive	0.06 – 0.12
5	Light clays	Strongly structured	0.12 – 0.5
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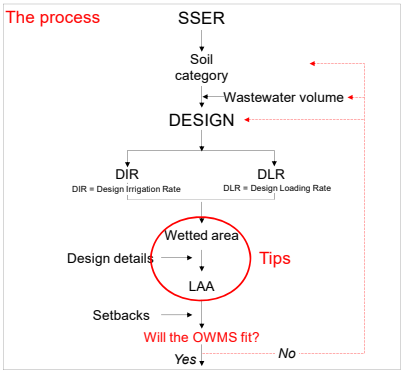
Trap and/or Tip

The process SSER



Wetted area and LAA

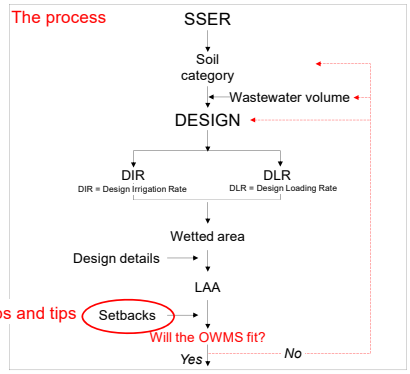
Tips

1. For sizing the OWMS, the AS/NZS1547 equation* is:
Wastewater volume / application rate = wetted area**
* The water balance equation is a better approach (e.g., *Trench3.0*). **Application rate = DLR or DIR.

2. The wetted area is not necessarily the same as the Land Application Area (LAA): "…an area of land used to apply effluent from a wastewater treatment unit and reserved for future wastewater application (where required)". (Director's 2017 *Guidelines for On-site Wastewater Management Systems*) The 'footprint' (the LAA) of some OWMSs may be larger than the wetted area.

3. The LAA may be divided into separate sub-areas (e.g., LAA1, LAA2, etc) of any shape, size and location provided (a) all sub-areas are watered simultaneously, and (b) all setbacks are satisfied.

The process SSER



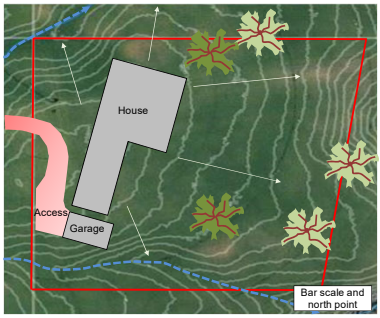
Setbacks

Horizontal setbacks from…
- buildings
- property boundaries
- downslope water bodies
- water bores

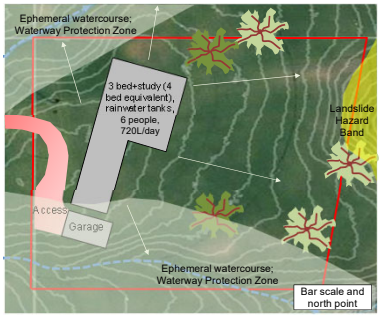
Vertical setbacks from…
- limiting layers (e.g., rock, Category 6 soil)
- Groundwater

Traps and tips → Setbacks → Will the OWMS fit?

Setbacks



Setbacks



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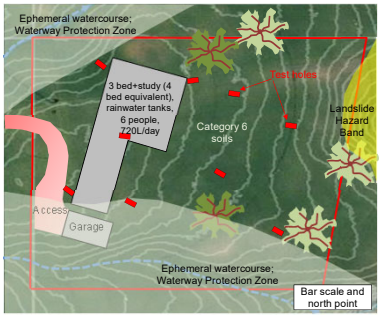

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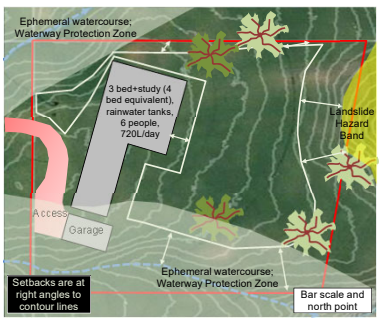
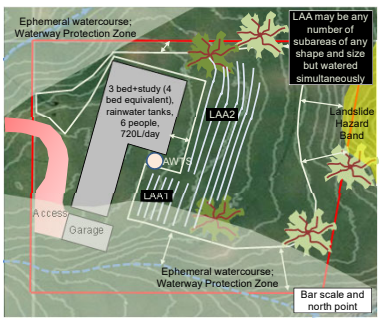


Setbacks



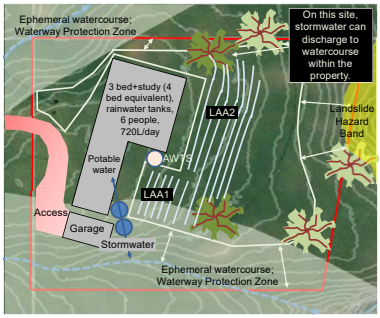
Setbacks

Horizontal setbacks from…
- buildings
- property boundaries
- downslope water bodies
- water bores
- stormwater disposal areas
- landslide hazard bands
- significant (and other) trees
- flooding, coastal erosion?, coastal inundation?, waterway protection zones? Karst?

Vertical setbacks from…
- limiting layers (e.g., rock, Category 6 soil)
- groundwater

Traps and tips → Setbacks → Will the OWMS fit?

Setbacks



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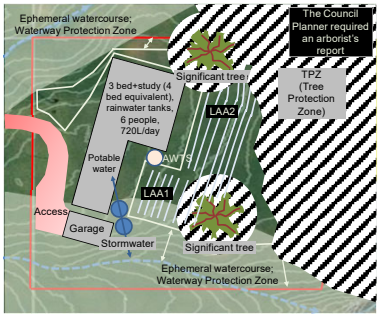
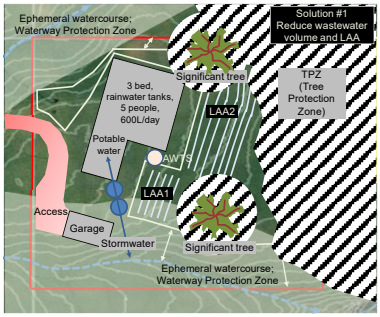


Setbacks



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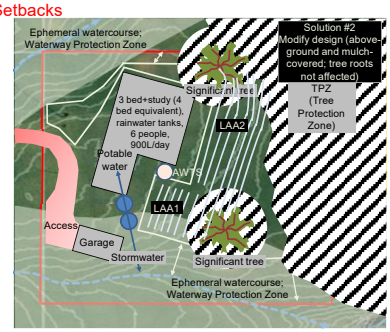


So far…

The traps we have been looking at have been *geotechnical* ones (SAND vs 'SAND'; drift in Soil Category, Category 5 and 6 soils…)

The OWMS may physically fit on the land, but it must also be…

Deemed to Satisfy (DTS), or…

a Performance Solution…or…

a Unique Solution.

A Deemed to Satisfy OSMS…

…has a certificate of accreditation issued by the Director of Building Control satisfying the performance requirements of the National Construction Code, but the associated land application area must be designed in accordance with AS/NZS1547 and this Guideline, otherwise a performance solution will be required.

Director's Guidelines for On-site Wastewater Management Systems. Director of Building Control, Version 2.0, July 2017. Page 3.

A Performance Solution for an OSMS…

- is an alternative to a Deemed-to-Satisfy (DTS) solution under NCC Volume Three (Plumbing Code of Australia),
- is site-specific and risk-based, and
- requires documented justification (eg a Specification Report by a suitably qualified person – typically a hydraulic engineer) and acceptance by the approving authority.

The Performance Solution must include a written design report demonstrating how the OWMS meets the relevant PCA Performance Requirements, supported by evidence of suitability, site and soil assessment, risk analysis, and (where required) owner acknowledgement. It must be assessed and formally accepted by the plumbing regulator / permit authority before approval.

Sources: NCC Volume Three (PCA), Part A2, and *Director's Guidelines for On-site Wastewater Management Systems.* Director of Building Control, Tasmania. Version 2.0, July 2017.

Example: Performance Solution…

Example: Performance Solution…

The local Council said (quoting from CBOS): *'there are several elements of this design which are outside the scope of the deemed to satisfy pathway of AS/NZS 1547:2012. The project will need to be submitted as a performance-based design, documented sufficiently to demonstrate full compliance with NCC 2022 Part C3. A performance solution this complex will need to identify all of the relevant performance requirements and demonstrate how each performance requirement is to be satisfied in a verifiable manner. The design will need to include some form of auditing process, and regime, given council and the owner, will need verification that the effluent being discharged to surface is of an acceptable standard.*

A letter of consent from the owner will be required, acknowledging the use of a performance solution. They will also need to enter into a statutory maintenance contract to have the system tested as per the report. With performance solutions, the important part is that the level of documentation needs to be sufficient to show exactly how it will meet all of the requirements.'

The owners proposed a composting toilet and separate greywater management in a constructed wetlands.
The wetlands is not Deemed to Satisfy.
A Specification Report is required.

A Unique Solution for an OSMS…

- is an alternative to a Deemed-to-Satisfy (DTS) solution under NCC Volume Three (Plumbing Code of Australia; PCA),
- is site-specific and risk-based, and
- requires documented justification and acceptance by the approving authority.
- is a prototype or one-off installation that is specifically designed for the premises where it is installed and is not for general sale.

"It must be designed by a person with appropriate qualifications and experience determined by the Director. The designer must refer to the relevant performance requirements and deemed-to-satisfy provisions of AS/NZS1547 (including Appendix A) or relevant Australian Standards or Guidelines from States and Territories or international organisations deemed relevant by the Environmental Health Officer for the design."

Source: *Director's Guidelines for On-site Wastewater Management Systems.* Director of Building Control, Tasmania. Version 2.0, July 2017. Section 4.2.

Historically…

1994: First AS1547 published, with technical guidance on site assessment and system design.

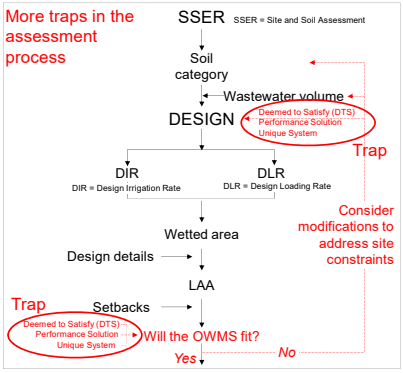
1994–2000s: National Construction Code (NCC) progressively developed the Deemed to Satisfy (DTS) versus Performance Solution framework. The DTS provisions become a well-defined compliance path in the NCC for regulated systems.

2000: Joint AS/NZS1547 published, with more explicit guidance on site assessment and system design.

Mid-2000s onwards: Australian OWMS practice begins to align with the NCC logic.

2012: Joint AS/NZS1547 revised, with performance statements and a risk management framework. Although this latest version had no DTS terminology, its intent and criteria could be considered as Acceptable Solutions for performance requirements in plumbing approvals.

2017: *Director's Guidelines for On-site Wastewater Management Systems* published. It explicitly deals in detail with DTS and Performance Solutions, and the requirements of OWMS to comply with the PCA in the NCC.



Traps and Tips Summary

- Sands and sands: Category 1 or Category 5, 6?
- Category 6 and 5: consider DLR, DIR similar to winter ET
- Wetted area not necessarily same as LAA
- LAA may be as separate sub-areas
- Wastewater assessment after bushfire, trees, etc.
- Setbacks: apply before designing the OWMS
- PCA in the NCC, and the Director's *Guidelines*

Thank you