

On-site Wastewater Management Training Course

Failing Systems

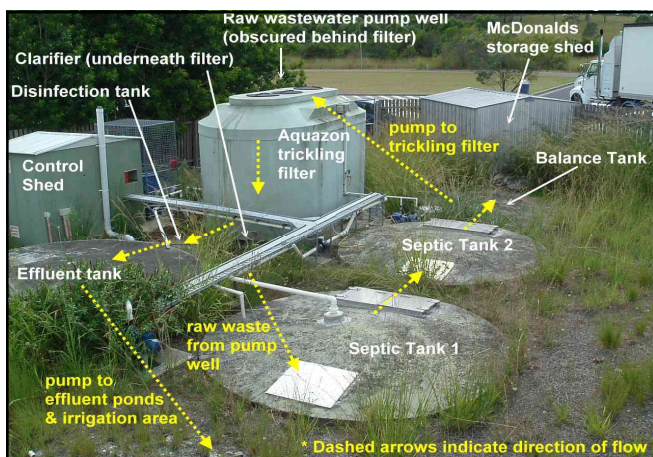
Auditing and Troubleshooting

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Introduction

- No amount of desktop assessment can substitute for an inspection of an existing onsite wastewater system
- Wide variation in designs and configurations makes standardised assessment a challenge
- Inspectors need a sound knowledge of past and present technologies and working knowledge of basic physical and biochemical processes
- Some of this can only be gained through field experience. Don't be afraid to have a look into a tank!

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A look inside a septic tank!



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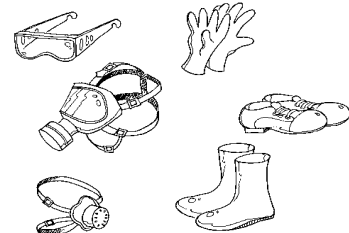
Occupational Work Health and Safety

- WH&S Hazards around on-site systems:
 - Manual Handling
 - Infectious Material
 - Confined Spaces
 - Hazardous and Dangerous Substances
 - Electrical Injuries
 - Fatigue, Sunburn and Heat Stress

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Work Health and Safety

- Use of Personal Protective Equipment (PPE) is just one strategy for managing WH&S risks



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Inspection Equipment

- Inspection log sheets or digital log / notepad
- Basic tools such as screwdrivers, multi-grips, shifters, hammer etc.
- Crowbar, torch and at least one bucket
- Sludge measuring device (e.g. Sludge Judge)
- Measuring tape and camera
- Sample bottles for water quality sampling

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Inspection Equipment



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Inspection Equipment



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Inspection Equipment

- Dye (e.g. Fluorescein) for checking flow paths
- Nessler's reagent (detects ammonia rich water)
- Imhoff cone or equivalent (activated sludge plants)
- Dissolved Oxygen (DO) or nutrient (N or P) test kits
- Free residual chlorine test kit and pH strips

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Inspection Equipment



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What is the purpose of inspection?

- There are two main questions to ask during a performance audit or assessment
 - Is the system operating as it was designed to operate?
 - Is the system adequately managing risks to public health and the environment?
- The answer to these questions will sometimes be no for one and yes for the other

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System Inputs

- What is the peak and average hydraulic load coming into the system?
 - Can use tables from *AS/NZ 1547:2012* to estimate wastewater generation rates
 - If more scrutiny is necessary have a look at previous water bills
 - Wastewater typically makes up approximately 60-80% of the total water usage

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System Inputs

- What sort of pollutant loads are entering the system?
 - Are there any activities going on that could cause influent to be different to typical domestic wastewater?
 - What sort of pressure is being put on the system by cleaning chemicals, detergents, disinfectants and antibiotics?

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System Inputs

- Premises that use, produce or generate food (dairy, brewery etc.) products can input high organic loads
- Beware unusual home activities and businesses e.g. hairdressing, catering
- Age and health of residents might impact on system performance e.g. use of chlorine bleach, high levels of drugs and antibiotics

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System Sizing

- Sized for hydraulic load
- Sized for sludge accumulation
- Sized for organic load (BOD)
- Sized for nutrient load (if required)
- General land capability assessment

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System Performance Indicators

- Adequate removal of Suspended Solids
- Adequate removal of BOD
- Pathogens
- Removal of nutrients?
 - Nitrogen
 - Phosphorus

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System Condition

- Structural integrity of all components?



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System Condition



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System Condition



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System Condition



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Sludge and Scum Accumulation



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Sludge and Scum Accumulation



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Effective Treatment Processes



Floatables

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Effective Treatment Processes



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Effective Treatment Processes



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Effective Treatment Processes



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Effective Treatment Processes



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Mechanical / Moving Parts



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System Overflow / Leakage



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System Overflow / Leakage



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Land Application System

- Effluent discharge (surface or groundwater)
- Suitable land application method?
- Suitable sizing?
- Suitable location?
- Point of application in relation to water table?
- Buffers, separation distances, attenuation
 - Nutrients
 - Pathogens

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Land Application System



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Fluorescein Dye Testing



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Rhodamine Dye Testing



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Audit Scenario

- Existing two (2) bedroom house (3 occupants) on town water supply
- Proposed construction of two (2) bedroom secondary dwelling (granny flat)
- 10ha rural residential lot on riverine corridor
- Existing development serviced by 2.5kL septic tank and gravity dosed (20m) absorption trench (0.6m w)
- Site soils = 400mm sandy loam over >300mm (weak) sandy clay loam over light/medium clay

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Thoughts??


- Why might we think this system is failing
 - Existing Load = $3EP \times 150L/p/day = 450L/day$
 - 2.5kL septic tank = >5 day HRT less accumulated sludge
 - Inlet and outlet tee's fitted?
 - Appropriate DLR for soil = 6-10mm/day (weak SCL) or LC?
 - Trench length = $Q/DLR \times W = 450/6 \times 0.6 = 125m$
 - Access to LAA?

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Questions to Ask

- Is primary treatment (septic tank) appropriate?
 - Lower effluent quality
 - Requires adequate soil depth and permeability (time) to achieve treatment standard
 - GW contamination / primary contact risk
- Is absorption trench land application appropriate?
 - Large area (LAA) requirement
 - Access / accidental damage risk

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Impact of changes??

- What impact will the proposed (granny flat) construction have?
 - Number of bedrooms increases from 2 to 4
 - Load = $6EP \times 150L/p/day = 900L/day$ (>100%)
 - HRT reduction to septic tank
 - Continuing trench overload/failure
 - Effluent surfacing risk

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Solutions

- What is an appropriate strategy to rectify/upgrade?
 - Primary or secondary treatment system?
 - Separate or combined treatment system for dwelling units?
 - Design hydraulic load?
 - Subsoil (absorption), Shallow (SSI, LPED) or Surface land application?
 - Any other mitigation or control measures to consider?

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Recommendation

- Proposed OSSM servicing approach
 - Recommend 'secondary' treatment system for combined load (both dwellings) ~ 900L/day
 - Recommend pressure-compensating SSI
 - Soil Loading Rate based on soil horizon within 0.6m of POA
 - Appropriate DIR = 3.5mm/day (SCL)
 - Topsoil importation may be necessary
 - Required LAA = 260m²

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Conclusions

- Don't be afraid to learn from plumbers, installers, designers and regulators with on-site experience
- Look at as many different systems as you can
- Be systematic and recognise the links between various processes
- Always keep an open mind about the possible cause of a problem