NSW Onsite Wastewater Management Guidelines, 2025

Training for Regulators and Designers

Buffer assessment

and

Risk mitigation

Buffer distances

- Risk assessed buffers to sensitive receptors are based on local constraints (site, soil and system) to ensure protection of public health, the environment and amenity
- Risk based buffers allow a reduction in buffer distance related to the mitigation of identified risks
- Buffers must be set in consultation with water authorities for drinking water extraction areas (surface or groundwater) and the NSW Food Authority in Priority Oyster Aquaculture Areas

Buffers – vertical separation

- Vertical separation is from the point of effluent application at the base of the effluent application system to the highest seasonal water table, as evidenced by soil mottling, or other limiting layer (bedrock or hardpan, etc.)
- Where the vertical separation distance is less than 0.6 metre, the point of application should be raised by altering the application method (SSI) or the importation of soil or sand to create a raised bed or mound

Buffers – Table 4-4

Buffer distance range	Relevant site and system constraints	Constraint scale	
		Low	High
Property Boundaries			
1.5m – 15.0m	Effluent quality	Minimum of secondary treated effluent (with disinfection and contractual service agreement)	Primary treated effluent
	Slope	0-6% (surface effluent application) 0 -10% (subsurface effluent application)	>10% (surface effluent application) >30% (subsurface effluent application)
	Method of application	Subsurface or subsoil application	Surface/ above ground application
Buildings			
2.0m – 6.0m	Effluent quality	Minimum of secondary treated effluent (with disinfection and contractual service agreement)	Primary treated effluent
	Slope	0-6% (surface effluent application) 0 -10% (subsurface effluent application)	>10% (surface effluent application) >30% (subsurface effluent application)
	Method of application	Subsurface or subsoil application	Surface/ above ground application
Retaining Wall/ Embankment Cutting			
Greatest of 3.0m or 45° angle from toe of wall	Slope	0-6% (surface effluent application) 0 -10% (subsurface effluent application)	>10% (surface effluent application) >30% (subsurface effluent application)
	Flood potential	Above 1 in 20-year flood contour	Below 1 in 20-year flood contour
	Geology/ Soil	Category 3 and 4 soils, low porosity regolith, deep, uniform soils	Category 1 and 6 soils, fractured rock, gravel aquifers, high porosity regolith
Path/ Walkway			
1.5m – 6.0m	Effluent Quality	Minimum of secondary treated effluent (with disinfection and contractual service agreement)	Primary treated effluent
	Fall direction	Downgradient of surface water body, property boundary, recreational area	Upgradient of surface water body, property boundary, recreational area
	Method of Application	Subsurface or subsoil application	Surface/ above ground application
Swimming Pool/ Recreational Area/ Market Garden			
3.0m – 15.0m	Effluent Quality	Minimum of secondary treated effluent (with disinfection and contractual service agreement)	Primary treated effluent
	Fall direction	Downgradient of surface water body, property boundary, recreational area	Upgradient of surface water body, property boundary, recreational area
	Method of Application	Subsurface or subsoil application	Surface/ above ground application

Buffers – Table 4-4 cont.

Buffer distance range	Relevant site and system constraints	Constraint scale	
		Low	High
In-ground water tanks and services (water, electrical, telecommunications and plumbing)			
3.0m – 15.0m	Effluent Quality	Minimum of secondary treated effluent (with disinfection and contractual service agreement)	Primary treated effluent
	Fall direction	Downgradient of surface water body, property boundary, recreational area	Upgradient of surface water body, property boundary, recreational area
Permanent Surface Water Body			
50.0m – 100.0m	Effluent Quality	Minimum of secondary treated effluent (with disinfection and contractual service agreement)	Primary treated effluent
	Surface water pollution hazard	Category 1 to 3 soils no surface water down gradient within 100m; low rainfall area	Category 4 to 6 soils permanent surface water <50m down gradient; high rainfall; high resource/ environmental value
	Slope	0-6% (surface effluent application) 0 -10% (subsurface effluent application)	>10% (surface effluent application) >30% (subsurface effluent application)
	Fall direction	Downgradient of surface water body, property boundary, recreational area	Upgradient of surface water body, property boundary, recreational area
	Drainage	No visible signs of saturation	Visible seepage, moisture tolerant vegetation; low lying area
	Flood Potential	Above 1 in 20-year flood contour	Below 1 in 20-year flood contour
	Application Method	Subsurface or subsoil application	Surface/ above ground application
Intermittent water bodies, farm dams, roadside drainage, drainage depressions			
15.0m – 40.0m	Effluent Quality	Minimum of secondary treated effluent (with disinfection and contractual service agreement)	Primary treated effluent
	Surface water pollution hazard	Category 1 to 3 soils no surface water down gradient within 40m; low rainfall area	Category 4 to 6 soils intermittent surface water <20m down gradient; high rainfall; high resource/environmental value
	Slope	0-6% (surface effluent application), 0 -10% (subsurface effluent application)	>10% (surface effluent application), >30% (subsurface effluent application)
	Fall direction	Downgradient of surface water body, property boundary, recreational area	Upgradient of surface water body, property boundary, recreational area
	Drainage	No visible signs of saturation	Visible seepage, moisture tolerant vegetation; low lying area
	Flood Potential	Above 1 in 20-year flood contour	Below 1 in 20-year flood contour
	Method of Application	Subsurface or subsoil application	Surface/ above ground application

Buffers – Table 4-4 cont.

Buffer distance range	Relevant site and system constraints	Constraint scale	
		Low	High
Bore/ Well			
15.0m – 100.0m	Effluent Quality	Minimum of secondary treated effluent (with disinfection and contractual service agreement)	Primary treated effluent
	Groundwater pollution hazard	Category 5 and 6 soils, low resource/ environmental value	Category 1 and 2 soils, gravel aquifers, high resource/ environmental value
	Geology / Soil	Category 3 and 4 soils, low porosity regolith, deep, uniform soils	Category 1 and 6 soils, fractured rock, gravel aquifers, high porosity regolith
Groundwater			
3.6m – 1.5m	Effluent Quality	Minimum of secondary treated effluent (with disinfection and contractual service agreement)	Primary treated effluent
	Groundwater pollution hazard	Category 5 and 6 soils, low resource/ environmental value	Category 1 and 2 soils, gravel aquifers, high resource/ environmental value
	Drainage	No visible signs of saturation	Visible seepage, moisture tolerant vegetation; low lying area
	Geology/ Soil	Category 3 and 4 soils, low porosity regolith, deep, uniform soils	Category 1 and 6 soils, fractured rock, gravel aquifers, high porosity regolith
	Landform	Hill crests, convex side slopes, and plains	Drainage plains and incised channels
	Method of Application	Subsurface or subsoil application	Surface/ above ground application
Bedrock/ Hardpan			
3.6m – 1.5m	Effluent Quality	Minimum of secondary treated effluent (with disinfection and contractual service agreement)	Primary treated effluent
	Groundwater pollution hazard	Category 5 and 6 soils, low resource/ environmental value	Category 1 and 2 soils, gravel aquifers, high resource/ environmental value
	Method of Application	Subsurface or subsoil application	Surface/ above ground application

NOTES from Table 4-2 and 4-3:

1. Buffers for subsurface drip irrigation of a minimum of secondary treated effluent downslope of an upslope property boundary, may be reduced to 0.5 metre.
2. Buffers to recreational areas on existing lots may be removed if no suitable alternative area is available within the lot boundary and provided subsurface or subsoil application and a minimum of secondary treated effluent are used.
3. In drinking water extraction areas and oyster aquaculture areas, buffers should be set in consultation with Water Authorities and NSW Food Authority. Examples can be found in the 'Designing and Installing On-site Wastewater Management Systems (WaterNSW 2023a) and NSW Oyster Industry Sustainable Aquaculture Strategy (DPI 2021a).
4. This includes bores and wells with water used for potable use (e.g. within a dwelling). Reduced buffers must be justified by viral die-off modelling. In groundwater extraction areas for a potable supply, buffers should be set in consultation with Water Authorities.

Buffers – new additions

- **Treatment system location** – no set buffer distance, but must consider the structural integrity of existing and proposed buildings and structures by maintaining >45 degrees from the base of the excavation to buildings or site boundaries
  - Must also consider noise and odour impacts
- **Market gardens** are now included in buffers with swimming pools and recreation areas

Drinking water sources

- Installing an OWMS can have an impact on local sources of drinking water (private or public, surface, groundwater, tank storage). A nearby OWMS must be considered in any risk management plan required under the Public Health Act 2010 for a supplier of water (private or public)
- Where an OWMS is present within 250m, limitations will be placed on applications for new groundwater bores by DCCEEW and WaterNSW

Buffer assessment - scenario

- Go through the buffer assessment scenario example

Viral die-off modelling

- Viral die-off modelling uses calculations to model the transport of viruses present in effluent away from the EAA and through saturated subsoils
- The model considers the level of treatment, groundwater temperature and subsoil characteristics as factors controlling the movement of viruses
- Where the average groundwater temperature is below 8.5°C, the viral die-off model is not suitable. Alternative mitigation measures will be required

Viral die-off modelling for mitigation

- Viral die-off modelling can be used as one of the mitigation measures for reduced buffers to drinking water, groundwater bores or shallow groundwater
- Go through the viral die-off model for the scenario example for primary and secondary treated effluent
  - Look at how small changes can impact the model

Viral die-off model parameters

- Groundwater temperature (daily mean minimum temperature statistics from BoM can be used in lieu of groundwater monitoring data)
- Orders of magnitude reduction (relates to treatment level – see Table B in example)
- These impact the days required for viral reduction (taken from Figure 1 of Cromer et al. (2001) over the page

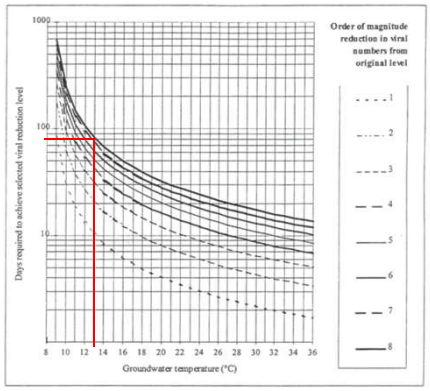


Figure 1. Relationship between Groundwater Temperature and Viral Die-Off Time for Various Order-of-Magnitude Reductions in Viral Numbers

Cromer et al. 2001

- 13ºC
- Primary = 7 orders = 80 days
- Secondary = 2-3 orders = 20-32 days

Viral die-off model parameters

- Effective porosity of soil (calculated from bulk density and specific gravity)
- Saturated hydraulic conductivity (K_{sat}) from Table 4-7 and 6-4 of the Guidelines
- Groundwater gradient (based on surface gradient)
- Vertical drainage before entering groundwater (base of EAA to greatest depth of soil testing or groundwater depth, whichever is less)

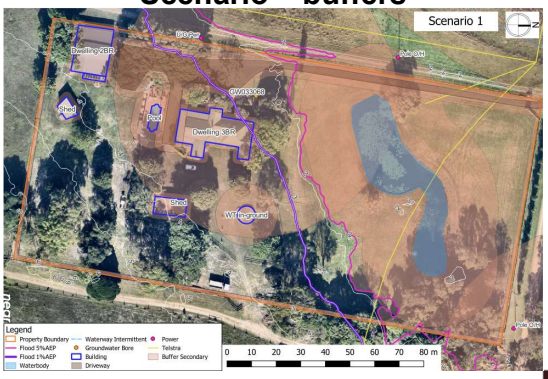
Viral die-off model parameters

- If the parameters aren't conservative, the model may underestimate the distance travelled by viruses in groundwater
- This model isn't indicative of viral die-off if wastewater or effluent enters a waterway through surface flows
- Disinfection – to be conservative, use the non-disinfected figure to cover if failure of disinfection occurs (i.e. chlorine tablets run out)

Groundwater bore buffers

- As a result of completing viral die-off modelling for different soils and scenarios, the Guidelines buffer for groundwater bores was increased to 100m
- Generally, this is conservative, except in sand soils, where viruses travel larger distances in saturated soils, such as in coastal villages with shallow seasonal groundwater

Scenario – buffers



Mitigating risk

- For all of the moderate or major constraints identified in the SSE, some form of mitigation is required
- Mitigation measures can include installation location, treatment levels, EAA sizing modelling, effluent application techniques (subsurface application, narrow trenches, raised application), modifying the environment or soil amelioration

Constraints and system selection

- See Table 7-1 for constraints and mitigation measures suitable to address those constraints
  - E.g. Slope – flat or convergent
    - Poor drainage
    - Run-on from surface and subsurface
  - Mitigation measures can include:
    - Divert all run-on (e.g. cut-off drain)
    - Modify the ground surface
    - Raised EAA options (e.g. raised beds or mound)

Constraints and system selection

- Small lot size or limited available EAA
  - Limited area for hydraulic and nutrient uptake
  - Limited available buffers
  - Multiple uses of EAA due to limited space
- Mitigation measures can include:
  - Minimise wastewater generation
  - Source separation approaches (WCT and GTS)
  - Improve effluent quality and reduce nutrients
  - Minimal footprint for treatment system and EAA
  - Nominate optimal exposure EAA location if possible

Mitigating risk

- Some other mitigation measures are:
  - Reducing DLR/ DIR
  - Pressure dosing for even distribution
  - Narrow trenches on steep slopes
  - Changing the location of the system
  - Tank anchoring due to groundwater
  - Subsurface or subsoil application as a barrier
  - Soil amelioration (e.g. dispersive or acidic soils)