

# Nominated Area Water Balance & Storage Calculations - Wick Trench Design (EPA compliant)

Site Address: **Beech Forest** Secondary Effluent - Wick Trench 4 bedrooms

INPUT DATA				DO NOT MODIFY CELLS IN BLUE			
Design Wastewater Flow	Q	900	L/day	Estimated daily load from 4 bedroom residential property, with standard water fixtures and town water			
Daily DLR		8.0	mm/day	Enter DLR from table at right based on Appendix A Table 9 EPA Code of Practice (2013) for limiting soil horizon			
Nominated Land Application Area	L	301.0	m sq	Used for iterative purposes to determine storage requirements based on nominated trench/bed bottom area			
Crop Factor	C	0.5-0.7	unitless	Estimates evapotranspiration as a fraction of $ET_0$ ; varies with season and crop type (from EPA 168)			
Retained Rainfall	RR	0.85	unitless	Proportion of rainfall that remains onsite and infiltrates; function of slope/cover, allowing for any runoff			
Void Space Ratio	V	0.45	unitless	Proportion of trench that is available for storage (assumes arch drain)			
Rainfall Data	Beech Forest			BoM 70th percentile monthly			
Evaporation Data	Beech Forest			SILO Data Drill Average monthly			

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 Proportion of trench that is available for storage (assumes arch drain)  
 BoM 70th percentile monthly  
 SILO Data Drill Average monthly

Bed Water available (days) = **90**

Soil Category (AS1547:2012)	DLR
Gravels & Sands (1)	NS
Sandy Loams (2) Loams (3) High/Mod Clay Loams (4a)	NS
Weak Clay Loams (4b)	20
Massive Clay Loams (4)	10
Strong Light Clays (5a)	12
Moderate Light Clays (5b)	10
Weak Light Clays (5c)	8
Medium to Heavy Clays (6)	5

Parameter	Symbol	Formula	Units	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total
Days in month	D	\	days	31	28	31	30	31	30	31	31	30	31	30	31	31	28	31	30	31	30	365
Rainfall	R	\	mm/month	88.1	90.8	114.0	178.8	207.7	242.0	232.7	243.6	213.1	187.2	134.1	113.6	88.1	90.8	114.0	178.8	207.7	242.0	2,045.7
Potential Evapotranspiration	$ET_0$	\	mm/month	128.0	105.0	87.0	54.0	34.0	22.0	26.0	38.0	55.0	81.0	97.0	118.0	128.0	105.0	87.0	54.0	34.0	22.0	846.0
Crop Factor	C			0.70	0.70	0.70	0.60	0.50	0.45	0.40	0.45	0.55	0.65	0.70	0.70	0.70	0.70	0.70	0.60	0.50	0.45	
<b>OUTPUTS (LOSSES)</b>																						
Evapotranspiration	ET	$ET_0 \times C$	mm/month	89.6	73.5	60.9	32.4	17.0	9.9	10.4	17.1	30.3	52.7	67.9	82.6	89.6	73.5	60.9	32.4	17.0	9.9	544.2
Percolation	B	$(DLR) \times D$	mm/month	248.0	224.0	248.0	240.0	248.0	240.0	248.0	248.0	240.0	248.0	240.0	248.0	248.0	224.0	248.0	240.0	248.0	240.0	2,920.0
Outputs		ET+B	mm/month	337.6	297.5	308.9	272.4	265.0	249.9	258.4	265.1	270.3	300.7	307.9	330.6	337.6	297.5	308.9	272.4	265.0	249.9	3,464.2
<b>INPUTS (GAINS)</b>																						
Retained Rainfall	Re	$R \times RR$	mm/month	74.9	77.2	96.9	152.0	176.5	205.7	197.8	207.1	181.1	159.1	114.0	96.6	74.9	77.2	96.9	152.0	176.5	205.7	1,738.8
Applied Effluent	W	$(Q \times D) / L$	mm/month	92.7	83.7	92.7	89.7	92.7	89.7	92.7	92.7	89.7	92.7	89.7	92.7	92.7	83.7	92.7	89.7	92.7	89.7	1,091.4
Inputs		Re+W	mm/month	167.6	160.9	189.6	241.7	269.2	295.4	290.5	299.8	270.8	251.8	203.7	189.3	167.6	160.9	189.6	241.7	269.2	295.4	2,830.2
<b>STORAGE CALCULATION (<math>\Delta</math>)</b>																						
Storage remaining from previous month			mm/month	0.0	0.0	0.0	0.0	0.0	9.4	110.5	181.8	258.8	260.1	151.6	0.0	0.0	0.0	0.0	0.0	0.0	9.4	
Storage for the month	S	$((Re+W)-(ET+B))/V$	mm/month	-377.8	-303.6	-265.1	-68.3	9.4	101.1	71.3	77.0	1.3	-108.5	-231.6	-314.1	-377.8	-303.6	-265.1	-68.3	9.4	101.1	-1,408.9
Cumulative Storage	M		mm	0.0	0.0	0.0	0.0	9.4	110.5	181.8	258.8	260.1	151.6	0.0	0.0	0.0	0.0	0.0	0.0	9.4	110.5	
Maximum Storage Depth for Nominated Area	N		mm	<b>260.1</b>																		
Maximum Storage Vol. for Nominated Area	V	$N \times L$	L	<b>78,300</b>																		

**BOTTOM AREA REQUIRED FOR ZERO STORAGE**  $m^2$  106.2 114.4 131.6 224.2 315.4 610.9 460.4 480.7 303.0 197.1 139.2 119.2 106.2 114.4 131.6 224.2 315.4 610.9

**MINIMUM BOTTOM AREA REQUIRED FOR ZERO STORAGE:** **611**  $m^2$  Value is based on the worst month of the year, so the balance overestimates the storage requirement for all other months. Assumes zero effluent depth (storage) in trench/bed. Model is run for 18-months to ensure trench/bed empties at least once per cycle.

- Wick trench dimensions (mm) Trench Width = **600** Depth = **450**  
 Bed Width = **1,000** Depth = **150**
- Recommended wick trench length (m) = **355.6**
- Minimum trench spacing: 1m for Soil Categories 1-3; and 1.5m for Soil Categories 4-6
- No. of trenches @ (max) 20m length = **18**
- Total footprint with 1m spacing ( $m^2$ ) = **962**
- Total footprint with 1.5m spacing ( $m^2$ ) = **1,140**

