WATER BALANCE ANALYSIS WORKSHOP SESSION – WORKED SOLUTION

Calculation of evapotranspiration-absorption/seepage area size by the water balance method.

Gisborne and Blenheim, NZ

Size of area for each month		GISBORNE, NZ							
1	2	3	4	5	6	7	8	9	
Month	Pan Evaporation	Evapotranspiration	Rainfall	Retained Rainfall	DLR	Disposal Rate	Applied Effluent	Size of area	
	E	ET	R	Rr	per month	per month	per month		
		Eo = ET = 0.75E		Rr = 0.75R		(3)-(5)+(6)		(8)/(7)	
	mm	mm	mm	mm	mm	mm	L	m^2	
Jan		141.0	71.4	53.6	155	242.5	18600	76.7	
Feb		111.0	65.9	49.4	140	201.6	16800	83.3	
Mar		93.0	94	70.5	155	177.5	18600	104.8	
Apr		62.0	107.1	80.3	150	131.7	18000	136.7	
May		46.0	84	63.0	155	138.0	18600	134.8	
Jun		36.0	107.4	80.6	150	105.5	18000	170.7	
Jul		37.0	118.7	89.0	155	103.0	18600	180.6	
Aug		46.0	78.1	58.6	155	142.4	18600	130.6	
Sep		66.0	73.1	54.8	150	161.2	18000	111.7	
Oct		93.0	76.1	57.1	155	190.9	18600	97.4	
Nov		120.0	65.2	48.9	150	221.1	18000	81.4	
Dec		136.0	59.9	44.9	155	246.1	18600	75.6	
First trial area = average monthly area m^2								**115.4**	

Depth of stored effluent								
1	2	3	4	5	6	7		Computed depth of effluent month X
Month	First trial area	Application rate	Disposal Rate per month		Increase in depth of stored effluent per month	Depth of effluent for month	Increase in depth of effluent per month	
		(8)/2)	(7)	(3)-(4)	(5)/n (void space ratio)	(X - 1)	+ (6)	
	m^2	mm	mm	mm	mm	mm	mm	mm
Jan	115.4	161.2	242.5	-81.2	-270.7	0.0	-270.7	0.0
Feb		145.6	201.6	-55.9	-186.5	0.0	-186.5	0.0
Mar		161.2	177.5	-16.3	-54.2	0.0	-54.2	0.0
Apr		156.0	131.7	24.4	81.2	0.0	81.2	81.2
May		161.2	138.0	23.2	77.4	81.2	77.4	158.6
Jun		156.0	105.5	50.6	168.6	158.6	168.6	327.2
Jul		161.2	103.0	58.3	194.2	327.2	194.2	521.4
Aug		161.2	142.4	18.8	62.7	521.4	62.7	584.1
Sep		156.0	161.2	-5.1	-17.1	584.1	-17.1	566.9
Oct		161.2	190.9	-29.7	-99.0	566.9	-99.0	468.0
Nov		156.0	221.1	-65.1	-216.9	468.0	-216.9	251.1
Dec		161.2	246.1	-84.8	-282.8	251.1	-282.8	0.0

To adjust maximum computed depth of effluent (saturated depth) can adjust size of trial area		
	m^2	mm
Trial	115.4	584.1
	120	481.6
	125	379.6
	124	399.3

6.2.Ans

Size of area for each month		BLENHEIM, NZ						
1	2	3	4	5	6	7	8	9
Month	Pan Evaporation	Evapotranspiration	Rainfall	Retained Rainfall	DLR	Disposal Rate	Applied Effluent	Size of area
	E	ET	R	Rr	per month	per month	per month	
		Eo = ET = 0.75E		Rr = 0.75R		(3)-(5)+(6)		(8)/(7)
	mm	mm	mm	mm	mm	mm	L	m^2
Jan		158.0	43	32.3	155	280.8	18600	66.3
Feb		130.0	44.6	33.5	140	236.6	16800	71.0
Mar		108.0	39.4	29.6	155	233.5	18600	79.7
Apr		73.0	53.8	40.4	150	182.7	18000	98.5
May		47.0	56.9	42.7	155	159.3	18600	116.7
Jun		35.0	68.6	51.5	150	133.6	18000	134.8
Jul		36.0	64.2	48.2	155	142.9	18600	130.2
Aug		48.0	57.9	43.4	155	159.6	18600	116.6
Sep		73.0	54.4	40.8	150	182.2	18000	98.8
Oct		103.0	57.2	42.9	155	215.1	18600	86.5
Nov		125.0	49.1	36.8	150	238.2	18000	75.6
Dec		146.0	49.7	37.3	155	263.7	18600	70.5
First trial area = average monthly area m^2								**95.4**

Depth of stored effluent								
1	2	3	4	5	6		7	
Month	First trial area	Application rate	Disposal Rate		Increase in depth of stored effluent	Depth of effluent for month	Increase in depth of effluent	Computed depth of effluent
			per month		per month		per month	month X
		(8)/2)	(7)	(3)-(4)	(5)/n (void space ratio)	(X - 1)	+ (6)	
	m^2	mm	mm	mm	mm	mm	mm	mm
Jan	95.4	194.9	280.8	-85.8	-286.1	0.0	-286.1	0.0
Feb		176.0	236.6	-60.5	-201.7	0.0	-201.7	0.0
Mar		194.9	233.5	-38.5	-128.5	0.0	-128.5	0.0
Apr		188.6	182.7	6.0	19.9	0.0	19.9	19.9
May		194.9	159.3	35.6	118.6	19.9	118.6	138.5
Jun		188.6	133.6	55.1	183.6	138.5	183.6	322.1
Jul		194.9	142.9	52.1	173.5	322.1	173.5	495.6
Aug		194.9	159.6	35.3	117.8	495.6	117.8	613.4
Sep		188.6	182.2	6.4	21.4	613.4	21.4	634.8
Oct		194.9	215.1	-20.2	-67.3	634.8	-67.3	567.5
Nov		188.6	238.2	-49.6	-165.2	567.5	-165.2	402.3
Dec		194.9	263.7	-68.8	-229.4	402.3	-229.4	172.9

To adjust maximum computed depth of effluent (saturated depth) can adjust size of trial area								
	m^2							mm
Trial	95.4							634.8
	100							475.7
	103							404
	104							381.1