

RDC WWTP consent change

- 1 ROTAN cf current method
- 2 Premise on which the consent is based is Table 1 (Rutherford et al 1989). Consent assumes no error margins.
- 3 Consent limit is an upper bound to permit an activity to take place with a reasonable allowance for variation.

Lake Rotorua targets (Rutherford *et al* 1989)

TABLE 1. Lake Rotorua Nutrient Inputs and Water Quality

Factors (1)	1965 (2)	1976-77 (3)	1981-82 (4)	1984-85 (5)	Target (6)
Population	25,000	50,000	52,600	54,000	—
Phosphorus inputs (t/yr)					
Raw sewage	5	18	30	47	—
Treated sewage	5	7.8	20.6	33.8	3
Stream	34	34	34	34	34
Internal	0	0	20	35	0
Total	39	41.8	74.6	102.8	37
Nitrogen inputs (t/yr)					
Raw sewage	34	100	170	260	—
Treated sewage	20	72.5	134	150	30
Stream (including septic tanks)	455	485	420	415	405
Septic tanks	50	80	15	10	0
Internal	0	0	140	>260	0
Total	475	557.5	694	>825	435
Average lake water quality					
Total phosphorus (mg/m ³)	—	23.8	47.9	72.6	20
Total nitrogen (mg/m ³)	—	310	519	530	300
Chlorophyll (mg/m ³)	—	5.5	37.8	22.6	10
Chlorophyll a (peak; mg/m ³)	—	28	62	58	17-24
Secchi disc (m)	2.5-3	2.3	1.9	1.7	2.5-3
Oxygen depletion rate (g/m ³ /day)	—	0.4	0.7	0.9	0.25

Note: Catchment area = 424 km²; surface area = 81 km²; mean depth = 10.7 m; volume = 0.865 km³; outflow rate = 18.5 m³/s; and residence time = 1.5 year.

Update of Table 1 (Rutherford et al 1989) Phosphorus

Table 2 Summary of nitrogen and phosphorus inputs to Lake Rotorua from 1990 to 2011. Adapted from Howard-Williams et al (1986), Rutherford et al (1989) and Rutherford et al (2011).

	1990-95	1995-00	2000-05	2005-10	2010	2011	Target
Phosphorus input							
Raw sewage t/y							
To irrigation site t/y	12	26	30	30	17	20	
Treated sewage t/y	1	1	1	1	1	3	3
Stream t/y ^a	37	37	37	37	37	37	33
Internal t/y	12	19	17	17	20	6	0
Rainfall t/y	1	1	1	1	1	1	1
P locked t/y	0	0	0	0	-16	-22	
Sub-total tP/y	51	58	56	56	43	25	37

Update of Table 1 (Rutherford et al 1989)

Nitrogen

		1990-95	1995-00	2000-05	2005-10	2010	2011	Target
Nitrogen input								
Raw sewage t/y								
To irrigation site t/y		83	94	64	76	47	54	
Treated sewage t/y		25	35	38	35	32	41	30
Stream t/y ^a		483	473	470	476	484	475	375
Septic tank t/y		18	18	18	15	10	10	0
Internal t/y		61	167	156	117	65	45	0
Rainfall t/y		30	30	30	30	30	30	30
Sub-total tN/y		617	723	712	673	621	601	435
In-lake change tN/y		-7	-111	-54	0	-121	-128	
Total tN/y		610	612	658	673	500	473	435
Median lake quality								
Total phosphorus mg/m ³		53	31	42	33	32	17	20
Total nitrogen mg/m ³		421	422	454	464	345	326	300
Mean chlorophyll a mg/m ³		9	11	26	19	15	15	10
Secchi disc m		2.4	3.2	2.6	2.6	2.6	3.3	2.5-3

Footnotes

a	flood flow particulate P and N are excluded because they probably settle on the lakebed and are not 'available' to phytoplankton (Rutherford <i>et al</i> 1989).						
Internal load (1990-2011)	calculated from March nutrient level - November (previous year) nutrient level.						
Stream nitrogen and phosphorus balances with the "Lakes Rotorua and Rotoiti Action Plan" catchment load estimates.							
	(39 tP/y, 556 tN/y)						
Phosphorus reduction by alum from an internal report of the Bay of Plenty Regional Council.							
In-lake nitrogen reduction is a balancing term to reconcile the total nitrogen load with the total nitrogen concentration							
	in the lake according to the formula of the 'Target' column.						

