

## Sustainable Nitrogen Load Target for Lake Rotorua

The Regional Council has a policy in their Regional Policy Statement restricting the annual nitrogen load to Lake Rotorua to 435 tN/yr. This is termed the sustainable nitrogen load for Lake Rotorua. The TAG has endorsed 435 tN/yr as the sustainable load in a position statement which has been updated once. At the time the TAG endorsed the 435 tN/yr it was part of a non-statutory process where it was a lower limit in a community programme to devise actions to remediate Lake Rotorua. Once the 435 tN/yr limit was adopted in the RPS the number itself became an absolute limit and gained greater significance.

### NWASCA paradigm<sup>1</sup>

Table 7 below was a summary compilation of the earliest Lake Rotorua and catchment nutrient studies and was collated by a group of scientists for NWASCA in the 1980s. BOPRC's policies regarding the water quality objective for Lake Rotorua and the target for the nitrogen limit for land-use was taken from the 'Target' column.

**Table 7:** Lake Rotorua nutrient inputs and water quality (Rutherford et al. 1989).

	1965	1976-77	1981-82	1984-85	Target
Population	25,000	50,000	52,600	54,000	-
<b>Phosphorus input</b>					
Raw sewage t y <sup>-1</sup>	5	18	30	47	-
Treated sewage t y <sup>-1</sup>	5	7.8	20.6	33.8	3
Stream + rain t y <sup>-1</sup> <sup>a</sup>	34	34	34	34	34
Internal t y <sup>-1</sup>	ND	0	20	35	0 <sup>b</sup>
Total t y <sup>-1</sup>	39	42	75	103	37
<b>Nitrogen input</b>					
Raw sewage t y <sup>-1</sup>	34	100	170	260	-
Treated sewage t y <sup>-1</sup>	20	66 <sup>c</sup>	134	150	30
Stream + rain t y <sup>-1</sup> <sup>a</sup>	405 <sup>c</sup>	485	420	415	405
Septic tanks t y <sup>-1</sup>	50	80	15	10	0
Internal t y <sup>-1</sup>	ND	0	140	>260	0 <sup>b</sup>
Total t y <sup>-1</sup>	475	558	694	>825	435
<b>Average lake quality</b>					
Total phosphorus mg m <sup>-3</sup>		23.8	47.9	72.6	20
Total nitrogen mg m <sup>-3</sup>		310	519	530	300
Chlorophyll mg m <sup>-3</sup>		5.5	37.8	22.6	10
Peak chlorophyll mg m <sup>-3</sup>		28	62	58	17-24
Secchi disc m	2.5-3	2.3	1.9	1.7	2.5-3
Deoxygenation g m <sup>-3</sup> d <sup>-1</sup>		0.4	0.7	0.9	0.25

<sup>a</sup> flood flow particulate P and N are excluded  
<sup>b</sup> internal loads may be non-zero even when external loads are reduced  
<sup>c</sup> the original table contains two typographical errors: 455 instead of 405, and 73 instead of 66.

<sup>1</sup> From; Nutrient Load Targets for Lake Rotorua, NIWA Client Report HAM2008-080, Prepared for BOPRC by Kit Rutherford.

At the time the table was compiled everything in the target column was an estimate. It was estimated that the average lake quality of 300 mg/m<sup>3</sup> TN would result from a Nitrogen input from the catchment of 435 tN/yr. Hence the catchment nitrogen load of 435 tN/yr has been adopted in the BOPRC's Regional Policy Statement. A lake nitrogen concentration of 300 mg/m<sup>3</sup> is consistent with the BOPRC's TLI objective.

In 2013 the average TN of the water in Lake Rotorua was 302 mg/m<sup>3</sup> ( and the average TP was about 20 mg/m<sup>3</sup>), the treated sewage input to Lake Rotorua from the land treatment system was about 30 tN/yr, all of the community septic tanks in the Lake Rotorua catchment have now been reticulated to the RDC WWTP.

So in the target column above, the only nitrogen figure not met was the stream and rain estimate of 405 tN/yr. This was actually in the region of 500 - 600 tN/yr. This is giving a strong indication that the policy in BOPRC's RPS restricting catchment land use to an output of 435 tN/yr has a large margin of precaution.

Alum dosing of the Puarenga and Utuhina Streams assisted in achieving the target lake concentration of about 20 mg/m<sup>3</sup>. It has been stated that the target lake nitrogen concentration of 300 mg/m<sup>3</sup> has been achieved as a flow-on effect from the lake TP being reduced by alum dosing. This also needs to be discussed.

#### **Target Loads Report - NIWA client report (Footnote 1) commissioned by BOPRC**

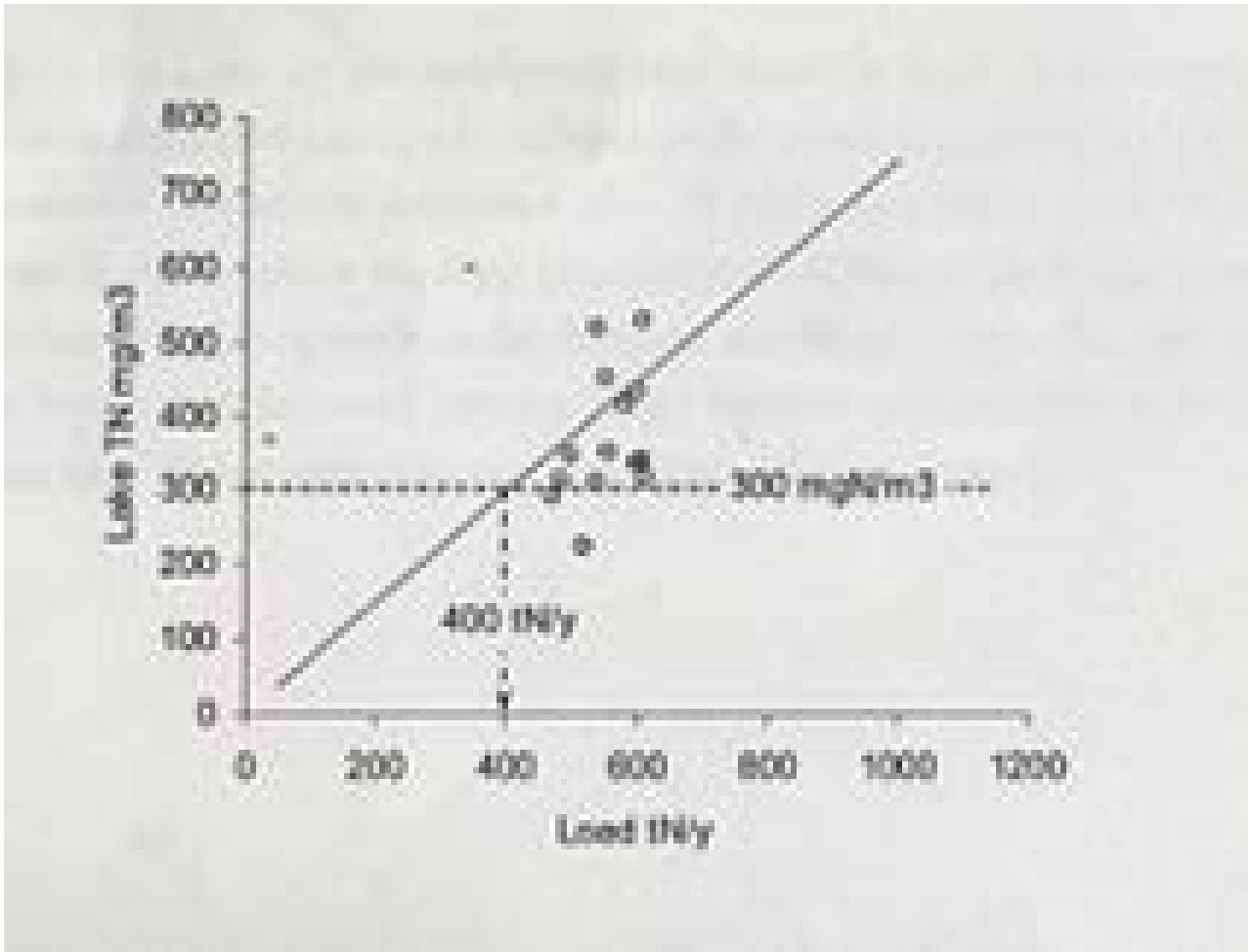
This report was commissioned by the BOPRC as part of the action plan process for the Lake Rotorua catchment, which started about 2003. The BOPRC's objective was to confirm that the estimated values in the target column of Table 7 above were still reasonable estimates.

Below is Figure 1 from the report. The catchment target would be represented where the data coincided with the in-lake nitrogen concentration target of 300 mg/m<sup>3</sup>. The report supported the BOPRC contention that a catchment nitrogen load limit of about 400 tN/yr would protect the in-lake nitrogen concentration at 300 mg/m<sup>3</sup>.

A different line may have been plotted but the uncertainty in achieving the objective TLI of 4.2 or the in-lake nitrogen concentration of 300 mg/m<sup>3</sup> required a degree of precaution while an action plan was discussed and compiled.

There is more certainty now and the target in-lake concentration of 300 mg/m<sup>3</sup> is a measured state rather than an estimated one.

The spread of catchment load data at 300 mg/m<sup>3</sup> is from about 480 tN/yr - about 600 tN/yr.



### Discussion Point

Our statement in the 'Position Statement' was made as part of a non-statutory process and may have included a degree of precaution.

The TAG needs to re-state their position on a sustainable nitrogen load for Lake Rotorua so that it accurately reflects their view. If it needs to include a degree of precaution that should be included in the statement. When policy is developed based on the statement they should feel that it accurately reflects their position.

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