Two issues highlighted with the lake model (J McIntosh 20/5/14)

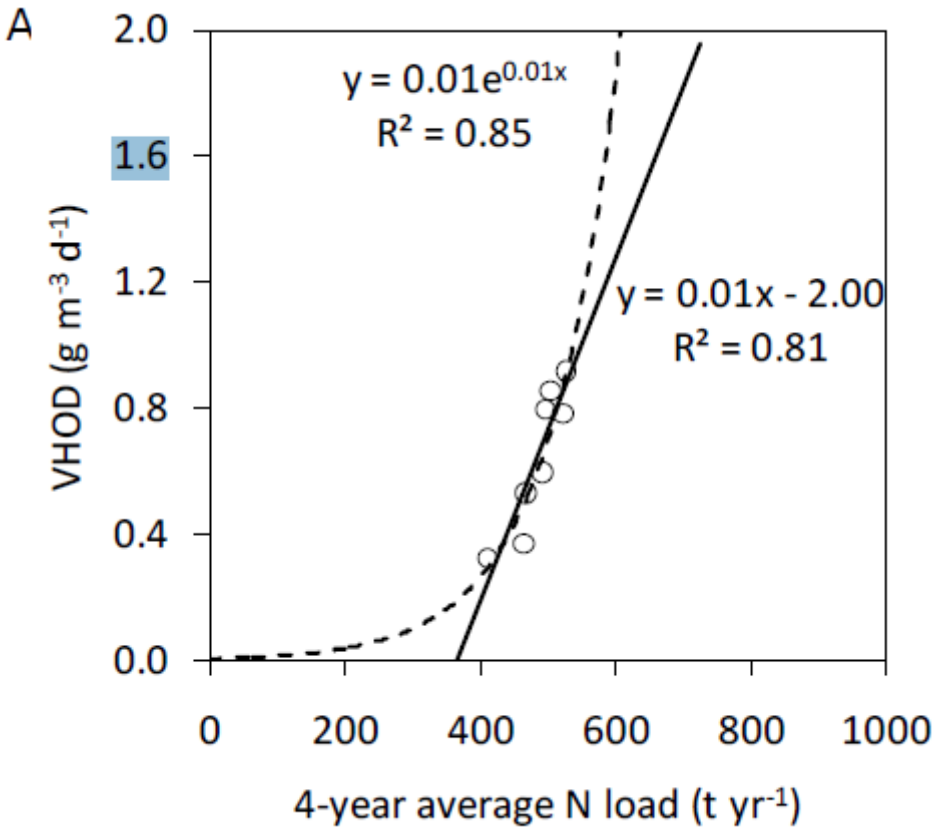
I consider that there is an inappropriate correlation in calibrating the de-oxygenation rate in the lake model and secondly that the effects of the direct treated sewage discharge had not dissipated from the lake in the calibration period to 2007. How this affects the model ouputs I do not know.

I have taken the values in the table below from plots in the Lake Manager's handbook and the UoW document on the lake model.

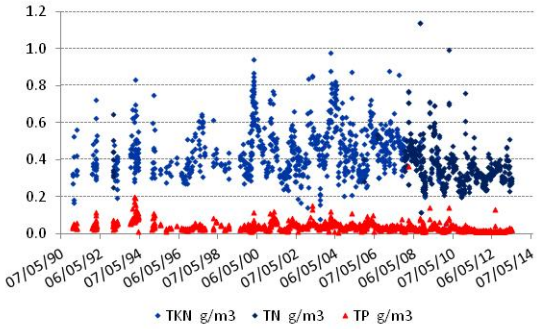
	Lake Rotorua VHOD	**Lake Rotorua TN mg/m3**	**ROTAN load t/y**	**Total annual N load on Lake Rotorua t/y**
1978	0.4	320	400	558
1979	0.6	325		
1980	0.55	340		694
1983	0.75	510		
1984	0.65	400		825
1985	0.8	450	550	825
1986	0.83	530		
		Bill Vant		Rutherford et al

Bill Vant correlated Rotorua's VHOD against the annual lake concentrations. These were two quantities based on in-lake measurements. The UoW model description has a correlation of Bill Vant's VHOD data plotted against the historic ROTAN catchment load. VHOD should have been plotted against data such as presented in Rutherford et al 1989 because VHOD is a result of the total load on a lake including the internal load. In addition, ROTAN was not envisaged as a method of assessing historic scenarios and the shortcomings of the historic data input is noted in the ROTAN model documents.

If you substitute the Rutherford data in the VHOD plot in the model document the line would be transposed to the right. The intersection with the x axis would be much higher. The intersection represents the VHOD apprx= 0. This by the original definition would be our catchment target.



I consider that the lake nutrient concentrations show that there was a change in the lake that started in 2006. This coincidentally was when alum dosing began. When I assessed the effectiveness of alum in reducing phosphorus in the lake there was a large reduction in phosphorus between 2006 and 2010 which I did not attribute to alum dosing. This indicates that some other process was acting on the lake nutrient concentrations. The only significant action that had been taken was removal the direct discharge of treated sewage effluent in 1991. Since then the lake nitrogen concentration has also reduced to the level predicted by Rutherford and his colleagues that would be the result of removing the treated sewage discharge.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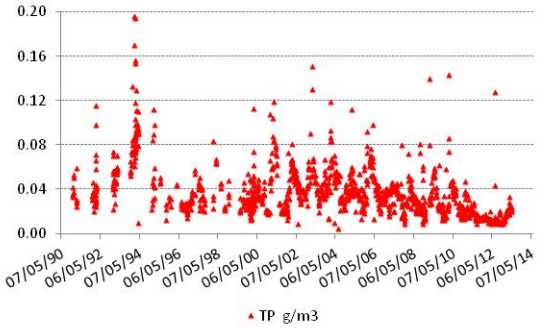
07/05/14
TKN g/m3
TN g/m3
TP g/m3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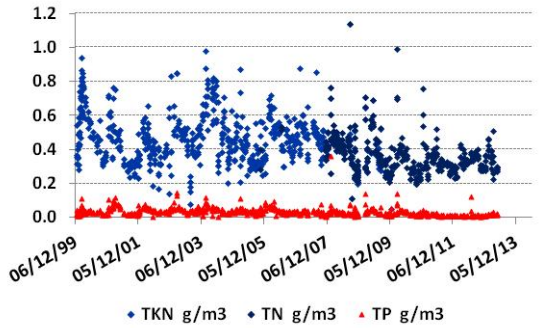
07/05/14
TP g/m3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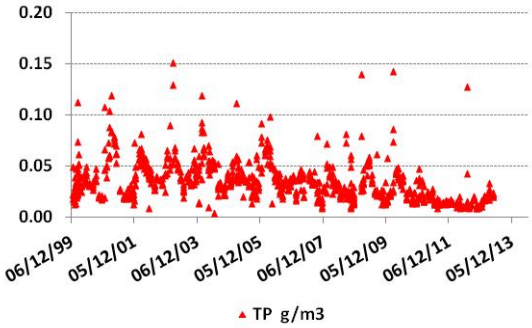
TKN g/m3
TN g/m3
TP g/m3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TP g/m3