

# THE OKARO CATCHMENT LAKE RESTORATION GROUP- FARM AND CATCHMENT ACCOUNTABILITY

## - WHAT ARE WE ACHEIVING?

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### **Abstract.**

Lake Okaro is one of the twelve Rotorua Lakes that is monitored by the Bay of Plenty Regional council, and one of the five lake catchments where land owners have been regulated with a nutrient loss cap applying to both nitrogen-loss and phosphorous-loss levels from land use activities (Rule 11). Lake Okaro is thirty one hectares in size and has a 367 hectare catchment, 90% of which is farmland. It is the most polluted lake in the Rotorua Lakes district with a current Trophic Level Index (TLI) of 5.1, recently improved from 5.5 in 2009, and has a target TLI of 5.0

In 2009 all six landowners within the Okaro Catchment formed the Okaro Catchment Lake Restoration Group (OCLRG) to try and reduce the impact of their farming operations. The group is supported with funding from the Sustainable Farming Fund (SFF). The land owners are taking a proactive approach to increasing Lake Okaro's water quality by investigating their environmental performance, primarily by utilising Overseer<sup>®</sup> and are considering the use of Environmental Management Systems (EMS) to demonstrate improvement and environmental accountability.

A private consultant was employed to run each of the properties through Overseer<sup>®</sup> to calculate the nutrient losses for the 2008-2009 and 2009-2010 seasons and compare these to their benchmarked levels (the average nutrient loss that occurred during 2001-2004). Within the Okaro catchment, nitrogen-loss has increased 3%, and phosphorus-loss has decreased 34%, compared to the benchmarked years. The group aims to further reduce these levels, so a whole catchment nutrient plan has been developed outlining further steps the land owners will take. Collective performance will continue to be assessed using Overseer<sup>®</sup>.

The origins of this project are unique in that the entire farming community has now agreed that their primary goal is to work in collaboration with each other, the wider community and the Regional Council to improve the water quality in Lake Okaro. This is a concerted attempt to 'take ownership' with a demonstrable Environment Management System (EMS) and to have a directive role in the long-term measures that will be needed to restore Lake Okaro.

### **Introduction.**

Lake Okaro is located thirty kilometres south of Rotorua, is 31 hectares in size with a catchment size of 367, 90% of this being in pasture. Fenced and planted riparian zones and permanent and production forestry occupy 38.7 hectares within the catchment. There are varying contours within the catchment, 2% of the catchment is classed as steep hill country, 6% flats, and the remainder is easy to steep hill country. The catchment consists of one dairy farm, one lifestyle block, three sheep and beef properties and Rotorua District Council (RDC)

reserve. The average rainfall for this area is 1.3 meters. There are three main soil types; Kaharoa ash, Rotomahana silt loam and a mixture of the two. These soils have moderate to high fertility.

Lake Okaro is one of the twelve Rotorua lakes monitored by the Bay of Plenty Regional Council, under the Regional Water and Land Plan. The Trophic Level Index (TLI) is a tool used to evaluate and compare the quality of the lakes; water clarity, algae biomass, nitrogen and phosphorus levels are all taken into the calculation. Under the Regional Water and Land Plan, Lake Okaro has a target TLI of 5.0. The 3 yearly average TLI in 2005 was 5.5, currently the lake is sitting at 5.1. Lake Okaro has the highest TLI out of the twelve Rotorua lakes.

The Regional Council has spent close to one million dollars in treatments (riparian protection, constructed wetland and in-lake flocculant trials) and a further \$200,000 of shared expenditure is proposed for meeting the councils 'Action Plan' targets with on-farm plantings, water detention projects and reserves retirement from grazing all within the Okaro Catchment.

The catchment has already undertaken extensive environmental projects and mitigation efforts supported by the Regional Council. A 2.2 hectare wetland has been constructed next to Lake Okaro. All of the streams that feed into Lake Okaro must first pass through this wetland. The only water that by-passes the wetland is during storm events, this storm water by-pass is engineered to protect the integrity of the wetlands. All of the streams and swampy areas within the catchment have been fenced off and planted in native bush.

Also within the catchment, the dairy farm winters all of the milking cows in two Herd Homes<sup>®</sup> and employs a deferred grazing system whereby the cows are only in the paddock for a maximum of four hours a day during the high risk drainage period. The effluent is caught in the concrete bunkers below the Herd Homes<sup>®</sup>. This effluent is strategically applied to sidelings and hay paddocks, avoiding valley bottoms, using a slurry tanker. This is applied once or twice a year during periods of high grass growth and low soil drainage.

Lake Okaro is one of five Rotorua lakes that are subject to a nutrient-loss cap known as Rule 11 in the Bay of Plenty Regional Council's Water and Land Plan. This has similarities to the Lake Taupo nutrient-loss cap regulation imposed by Environment Waikato known as Variation 5. To comply with Rule 11 all the Okaro properties have been assessed with Overseer<sup>®</sup> based on 2001-2004 farm data which was averaged to determine both nitrogen and phosphorous nutrient loss benchmark or nutrient discharge allowance. Landowners are required to farm within this allowance and cannot change land use or intensify land use if it will increase nutrient loss levels. Unlike the Taupo regulation, Rule 11 does not prescribe further reduction of nutrient losses below the benchmark level. However it is acknowledged that if lake water quality is to be improved, landowners need to be considering voluntary ways to reduce nutrient losses well below the level prescribed by the Rule 11 regulation.

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A private consultant was employed to run each of the properties through Overseer<sup>®</sup> to calculate the nutrient losses for the 2008-2009 and 2009-2010 seasons and compare these to their previous (2001-2004) benchmarked levels. From these results the consultant outlined various options that could be undertaken to reduce nitrogen-loss and phosphorus-loss for each individual property. The landowners also contributed their own ideas to further mitigate the nitrogen and phosphorus-loss occurring within the catchment. From this a three year Community Action Plan has been developed.

### Results from preliminary Overseer<sup>®</sup> Analysis.

Table 1 below shows the recent nitrogen-loss levels as calculated by Overseer<sup>®</sup> and compares these results to the historic benchmark levels for each of the properties. Within the catchment two of the properties have increased their nitrogen-loss levels from the benchmark period.

Catchment Annual Nitrogen Losses (kgN/ha)					
Participant	Benchmark	Current			Individual Variance (average to benchmark)
		2008/09	2009/10	Average	
Property A	7	8.5	8.5	8.5	21%
Property B	25.9	26	25.1	25.6	-1%
Property C	9.8	7.9	6.6	7.3	-26%
Property D	10.4	9.1	9.1	9.1	-13%
Property E	5.6	5.6	5.6	5.6	0%
Property F	10	11.2	11.2	11.2	32%
Average	11.5	11.4	11.0	11.2	

**Table 1:** Annual Nitrogen losses to the Okaro Catchment for OCLRG participant land owners

Table 2 below shows the recent phosphorus-loss levels as calculated by Overseer<sup>®</sup> and compares these results to the historic benchmark levels for each of the properties. All of the properties are either maintaining or below their benchmark levels.

Catchment Annual Phosphorus Losses (kgP/ha)					
Participant	Benchmark	Current			Individual Variance (average to benchmark)
		2008/09	2009/10	Average	
Property A	2.16	2.20	2.19	2.20	2%
Property B	6.0	2.4	2.6	2.5	-59%
Property C	2.7	2.4	2.4	2.4	-12%
Property D	2.0	1.2	1.2	1.2	-38%
Property E	0.5	0.5	0.5	0.5	0%
Property F	2.5	1.3	1.3	1.3	-47%
Average	2.6	1.7	1.7	1.7	

**Table 2:** Annual Phosphorus losses to the Okaro Catchment for OCLRG participant land owners

The increase in fertiliser price within the period 2004-2009 has most likely had an effect on the level of phosphorus fertiliser applied during this time. The OCLRG has initiated more frequent and co-ordinated soil testing to give a better understanding of the soil fertility. These soil tests have indicated areas that have high Olsen-P, allowing these areas to modify fertiliser application and take advantage of the available phosphorus already within the soil. One of the farms also dropped 100 head of deer after the benchmark period due to the high phosphorus-loss associated with this class of stock. This would also contribute to significant reductions in phosphorus-loss within the catchment.

Table 3 below illustrates the nutrient losses over the whole catchment compared to the benchmark nutrient loss levels. This shows that as a catchment phosphorus-loss has decreased by 34%, this equates to a decrease of 246 kgP/ha for the 2008-2009 season and 236 kgP/ha for the 2009-2010 season. Nitrogen-loss has increased by 4%, this equates to an increase of 158 kgN/ha for the 2008-2009 season and 34 kgN/ha for the 2009-2010 season.

<b>Calculated nutrient loss over the whole catchment (kgP/ha and kgN/ha) relative to benchmark</b>				
	Benchmark	2008'09	2009'10	Individual Variance (average to benchmark)
Phosphorus	948	702	712	-34%
Nitrogen	3,654	3,812	3,688	3%

**Table 3:** nutrient loss over the whole catchment

A summary of the mitigation methods and actions that have been considered by OCLRG land managers described within the report completed by the private consultant are listed below. An outline of the tasks to be undertaken on each individual property is discussed in the following sections of the report.

- Altering stocking levels and stock classes.
- Altering stocking policies.
- Altering the sheep:cattle ratio.
- DCD use.
- Retirement of land from grazing.
- Using supplements low in Protein.
- Managing Critical Source Areas (moving gateways out of storm channels, keeping stock out of ephemerals during high risk periods).
- Strategic use of Fertilisers.
- Detention dams to buffer storm water run-off events.

### **Three year Community Action Plan.**

The OCLRG Action Plan was completed 15<sup>th</sup> November 2010. All of the property owners/representatives have signed the action plan. The agreement states that they will complete the activities within the time frames outlined in the Action Plan to the best of their abilities. For the duration of the SFF project, the progress of the properties on their individual

action plans will be tracked during the yearly update of the properties Overseer<sup>®</sup> files. There is a desire to extend this project outside the SFF three year time frame, but a formal method of monitoring and auditing needs to be established. The farmers involved are employing a collective, collaborative and transparent approach to nutrient-loss management. All information obtained and calculated is shared openly between the individuals of OCLRG.

### **Summary of individual property actions.**

#### Property A:

- Relocation of cattle yards out of water course (CSA). Construction to begin shortly.
- 26 hectares to be planted in production forestry, fencing and planting is in progress.
- Construction of at least one P-Detainment Bund. To be completed within the next three years.
- Reduce breeding cow numbers and overall stocking rate. This will be a gradual change.
- Replacing some female stock with male stock over the high risk drainage period. This will be introduced this winter.

#### Property B:

- 1 hectare to be retired to production forestry. To be completed within the next 12 months.
- Changing of stocking policy. 10 hectares will now run male stock exclusively over the high risk drainage period. To be introduced this winter.
- Reducing stocking rate. Beginning this winter.
- Strategic placement of fertilisers. Limiting the amount of Phosphorus and nitrogen applied to stock camp sites. Already in practice.
- Construction of at least 2 P Detainment Bunds. To be completed within the next three years.
- Strategic use of DCD (valley bottoms and stock campsites). First application this Autumn.

#### Property C:

- Dicalcic Superphosphate will be used in place of conventional phosphate fertilisers. This is already in Practice.
- One area that has been indicated to be a large problem is where a track has been cut down a valley bottom. About 2 hectares of flats run into this valley, extensive erosion is occurring as the track doesn't provide any restriction on flowing water during rainfall events. This track will be moved, and will now follow the hillside. This will allow the current track to re-grass reducing erosion and the amount of sediment run off from the track and paddock in general
- Maintaining a low stocking rate.
- Mid way down the top half of the catchment is 1.2 hectares of flat. Currently this is used as a hay paddock. This area is shut up from mid October to June (a couple of cuts are taken during this period). This area acts as a large filter in rainfall events

during this period. There is rarely any run off leaving the paddock, yet the sediment covered fence at the top end of the paddock clearly indicates that there is a flow entering the paddock. The grass is cut and carried to other areas of the farm, thus removing the nutrients that have been caught during the rain fall events. The group feels that this is a very important attribute of the catchment. This hay paddock will continue to be managed in the way outlined above to continue to capture the benefits mentioned above

- Construction of a P-Detainment Bund on the property boundary between Farm F and Farm C to buffer the flow of water further down the catchment (also collaborating with Farm D).

#### Property D:

- Throughout the winter there will be no female cattle carried on the Okaro Catchment. Throughout the rest of the season, female cattle will not be on the Okaro catchment for periods exceeding three days.
- Retire and plant the wet valley bottom that runs into the water course. The runoff down this valley during rainfall events is quite substantial. This strip of planting (2m by 100m) will act as a buffer strip, slowing down and absorbing some of the runoff.
- Help construct of a P-Detainment Bund on the property boundary between Farm F and Farm C to buffer the flow of water further down the catchment (also collaborating with Farm D).

#### Property E (RDC):

- This area is public reserve land and surrounds Lake Okaro.
- Previously grazed areas of the reserve are continuing to be fenced off and planted in both native and exotic trees. The retirement and planting programme will be finished in 2011.

#### Property F:

- Primarily running breeding beef cows on the property. An 18 month system will now be put in place; cattle will be purchased at 4 days and sold before their second winter. There will be a mixture of male and female stock. Increasing the number of male stock on the property will reduce urine spot effect and reducing the size of the animal will reduce soil disturbance thus reducing phosphorus loss. These changes are already in progress.
- One hectare of steep sideling will be retired and planted in native bush. This is to be completed within the next three years.
- Construction of a P-Detainment Bund on the property boundary between Farm F and Farm C to buffer the flow of water further down the catchment (also collaborating with Farm D).

#### **Conclusions.**

Phosphorus-loss has been reduced significantly since the benchmarked period and the aim now is to maintain these reduced levels. The focus from here will be more on reducing the nitrogen-loss from the catchment. Practical mitigation measures are already being put in place to further reduce the nutrient loss from the catchment, with the main emphasis being on manipulating stock classes and policies.

For the duration of the SFF project, the progress of the properties on their individual action plans will be tracked during the yearly update of the properties Overseer<sup>®</sup> files. This will be completed by a private contractor who will continue to give insight into further nutrient management methods and tools that could be employed. There is a desire to extend this project outside the SFF three year time frame, but a formal method of monitoring and auditing needs to be established.

The Okaro Catchment Lake Restoration Group is taking a unique approach to improving the quality of Lake Okaro's water quality. This project illustrates a community employing a collective, collaborative and transparent approach to nutrient-loss management.

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