**In the matter of** The Resource Management Act 1991

And

**In the matter of** Lake Rotorua Nutrient Management **Proposed Plan Change 10** to the Bay of Plenty Regional Water and Land Plan

Statement of Evidence of **Christine Bridget Robson**

for

CNI Iwi Holdings Limited (CNIIHL)

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**Qualifications and experience**

1. My full name is Christine Bridget Robson. I am a consultant specialising in RMA environmental management, with particular interest in the effectiveness of the entire policy cycle, from the science that supports RMA policy development, to compliance with that policy.
2. My qualifications are BAgSc and MPhil in Resource and Environmental Planning, both from Massey University. My work experience has spanned central and regional government, and industry - mainly the forestry and energy industries. The subject of my work has included Land Use Capability assessment, RMA policy development for both BOPRC Regional Policy Statements, the development of/input to several regional plans, and the development of the Plantation Forestry NES. My policy experience is from the “ground zero” decisions on acquiring the raw science to policy development then through to policy implementation. Roles that have focussed on RMA policy advocacy and implementation have been primarily for large corporates. I’ve managed environmental operations for Carter Holt Harvey Forests and compliance for hydro and geothermal programmes for Mercury. An eight-year role of developing and managing the BOPRC geothermal programme required that I became familiar with the strengths and weaknesses of conceptual and reservoir modelling.

**Scope of Evidence and Summary**

1. The scope of my evidence concerns the process of developing Proposed Plan Change 10 and how CNIIHL, with a landholding 3180 Ha in the catchment, were able to interact with that process. I also address various aspects of the policy design, and the use of models in that design and how these affect CNIIHL.
2. Although this is a Council Hearing, I have read the Code of Conduct for Expert Witnesses contained in the Practice Note issued by the Environment Court December 2014. I have complied with that Code when preparing my written statement of evidence and I agree to comply with it when I give any oral presentation.
3. My evidence addresses the following subjects:

* CNIIHL Context for interacting with Plan Change 10
* Policy Development Process
* Policy Development logic
* Use of models – Overseer
* Plan effectiveness and efficiency assessment

# **CNIIHL Context for interacting with Plan Change 10**

1. The Central North Island Forests Land Collective Settlement Act 2008 returned a considerable amount of land to 8 Iwi:

* Ngāi Tuhoe; and
* Ngāti Manawa; and
* Ngāti Rangitihi; and
* Ngāti Tuwharetoa; and
* Ngāti Whakaue; and
* Ngāti Whare; and
* Raukawa; and
* The Affiliate Te Arawa Iwi/Hapu

1. 3180 Ha of this land is in the Lake Rotorua catchment. This is approximately 6% of the catchment land area. Land was returned in 2009 with existing Crown Forestry Licences. These progressively terminate over a 35 year period, ending in 2045.
2. On 25 June 2009 the CNI forest lands were vested in CNI Iwi Holdings Limited (CNIIHL) as Land owner and trustee of the CNI Forest Lands. CNI Iwi Holdings Ltd (CNIIHL) therefore governs decision-making around activities anywhere upon it, including planning and implementing land use change on behalf of the Board of iwi owners.  Through a Land Management Agreement CNIIHL has Land Management of the CNI Forest Lands to its wholly owned subsidiary CNI Iwi Land Management Ltd.  CNIILML is charged with ensuring that the economic potential of the CNI Forests Land is developed and maximised to the fullest extent possible, but in a sustainable manner and having regard to the cultural and environmental features of the land. As a prudent land owner CNIIHL aspires to spread its income risk by having a range of land use activities, which create a diversified income portfolio. Currently the CNIIHL land is overly exposed to growing a long term tree crop (monoculture plantation forest) with a consequential exposure to tree crop land rentals.
3. Despite the significant land holding as a proportion of the catchment – possibly the biggest single landholding – CNIIHL’s participation in the process of developing Plan Change 10 has been very peripheral. Although the rules are primarily about controlling land use, the CNIIHL land owners were not invited to be a part of the Stakeholder Working Group (StAG) in this plan change development process. They were not able to participate in the predecessor which generated Rule 11, as they were not the land owner at that time.
4. There are several reasons this appears to have happened. Firstly Council used the land use control rule suite of the Regional Water and Land Plan “Rule 11” as the basis for Plan Change 10 policy and rule development. All aspects of Rule 11 predated settlement, so the land was in Crown control and the Crown did not participate in the Rule 11 plan development process. Secondly it appears that Council have regarded CNIIHL as a forester for the purposes of Plan Change 10 development. Council appears to have assumed that the wants and needs of a forester (often a licensee or lessee) would be congruent with the wants and needs of the land owner, independent of whether the land covered in forest is capable of better or higher use. Those differences between land owner and tenant were not explored by the collaborative stakeholder technical advisory group (StAG) in the context of CNIIHL. Thirdly CNIIHL appears to have been a blind spot at times when Maori land was discussed. Settlement land is neither Te Ture Whenua nor under the control of the Maori Trustee, thus neither of these parties, who were represented on the collaborative stakeholder group developing the policy and rules, regarded themselves as being responsible for representing CNIIHL’s issues. It remained a blind spot in Council’s assessment of underutilised Maori Land[[1]](#footnote-1). Te Arawa Lakes Trust did not see it as their role to speak for CNIIHL, as they saw their purpose for being involved as being directly related to the Lakes and Lake beds: *Te Arawa has mana whenua as the owner of the lakebeds and provides cultural advice on all aspects of the lakes.*
5. The double timeline below identifies land use changes in the catchment and the Central North Island Forests land Collective Settlement Act 2008 settlement, compared to the regional rule development processes. This shows the mismatch of when CNIIHL achieved agency over its land holdings, compared to BOPRC’s identification of them as a landholder affected by land use rules.

### Figure 1: Timeline compared to BOPRC rule development

|  |  |  |
| --- | --- | --- |
| **Lake Rotorua catchment land use change** |  | **BOPRC develops constraints on land use** |
| Sudden huge change to land use capability | Jun 1886 |  |
| CNI land alienated from constituent Iwi | 1900s |  |
| Depression era make-work forest planted on land that animals got "bush sickness". | 1930s |  |
| Cause of "bush sickness" remedied, propelling land use change | 1935 |  |
| Main period of land conversion from bush or scrub to mainly drystock | 1950s |  |
| Urea price drops making dairy expansion and intensification more attractive | Mid 1980s |  |
| Still low proportion of land in Lake catchment being used for dairy | 1996 |  |
|  | 2002 | Rule 11 proposed to cap nutrient losses |
|  | Oct 2005 | Rule 11 operative |
| Te Arawa Lakes Settlement Act 2006 | 2006 |  |
| CNI Forest Collective Settlement Act. Land back, but with forest licence of up to 35 years | Sep 2008 |  |
| Motu report identifies large-scale expansion of land in dairy between 1996 and 2008 | Aug 2009 | Council reviews Rule 11. Due to insufficient benchmarking, and no monitoring unable to accurately tell whether land use change or within-use intensification has occurred. |
|  | 2011 | Lake Rotorua Primary Producers Collective (LRPPC) formed. Purpose: “advancing the interests of rural landowners” (pastoral only). |
|  | 2011 | NPS- FM released |
|  | Mar 2012 | PCE reports water quality decline inc. due to N |
|  | Nov 2012 | StAG first meeting. Forestry rep advised that CNIIHL is the landowner, they are the licensee. |
|  | Feb 2013 | “Otorua agreement” resolves RPS appeal and extends timeframe to clean up Lake. No mention of amending criteria for RPS WL5B. |
|  | Jun 2013 | StAG accept the LRPPC "Integrated Framework", rule design, and extra criteria to assess appropriateness |
|  | Jun 2014 | Draft rules released to wider community |
|  | Aug 2014 | RPS N limit for Lake Rotorua confirmed |
| CNIIHL feedback on draft rules identifies that the rules will severely constrain CNI land use opportunities | Oct 2014 |  |
|  | Aug 2015 | StAG -"*it is clear that NDAs, like current Rule 11 benchmarks,* ***are part of a landowner’s property right*** *i.e. owned by landowner*  I.e. StAG should have had particular regard for **landowners** in any consultation |
| CNIIHL provides further feedback on draft rules. Identifies that the rules will severely constrain land use opportunities on CNI land capable of higher and better use | Oct 2015 | Draft rules released to wider community |
|  |  | Still no active engagement with CNIIHL |
|  |  |  |

# **Policy development process**

1. At the time Plan Change 10 was being developed, Council planners were encouraged to use a collaborative process, based on all-sector collaboration principles underway at a national level, called the Land and Water Forum (LAWF). They also heeded two of the NPS-FM’s purposes, to set limits and to allocate.
2. In using a collaborative process, and taking an allocation approach Council do not appear to have been alert to the risks inherent in this process and this policy choice, or the potentially malign effects of using them in combination. If they had, two risks would have been evident. Firstly the risks of process capture by the group who are the primary subject of the regulation would have been identified and could have been thwarted. Secondly the policy design risk would reveal that it relied very heavily on precise allocation of N, but lacked the tools to accurately ascribe N leach quantity per property.
3. This evidence assesses these two issues. The first in the section on policy development process - an assessment of the use of the collaborative process. The second in the section on policy development logic - an assessment of the use of an allocation regime.
4. **Factors affecting the success of collaborative processes**

This part of the evidence assesses factors that Council should have been alert to for the functioning of collaborative processes generally. It then discusses risks for collaborative processes being used in the context of vested interests battling for a scarce resource, where the outcomes of various regimes change outcomes for individuals and sectors by multiple millions of dollars.

1. Collaborative processes and business transactions have strong parallels. In business transactions, before prospective partners will strive toward agreement on the business terms, two conditions are necessary. The first is that all participants must be motivated toward a common goal. The second that each party must recognize what the other participants contribute to that goal. For meaningful participation to occur these same two conditions must exist among participants in a collaborative process. These two conditions are threshold conditions, not a guarantee of success. They must exist before a collaborative process can be conducted with integrity.[[2]](#footnote-2) If some parties who will be affected by the outcome cannot meaningfully participate in the process, serve as a check on established interests, and thus don’t influence the outcome, this participatory process becomes merely cosmetic. It affirmatively subverts the good-governance aims it is meant to achieve.
2. A goal of allocating limited and scarce resources between parties, when those resources are fundamental to their economic survival, sets up a direct competition for those resources. There is no common goal for all parties and there is no opportunity to achieve a common goal. The circumstances for consensus being reached therefore do not prevail i.e. Once Council settled upon allocation as a regime, use of a collaborative group made up of those with most to lose was a recipe for self-interest to prevail among those with the most power in the group. Which is what has happened.
3. Regulatory capture[[3]](#footnote-3) is the result of process by which regulation is consistently or repeatedly directed away from public interest and toward the interests of the regulated industry, by the intent and action of the industry itself. Capturemoves regulation away from the service of one goal (in this case the public interest is that land-based businesses reduce and pay for externalities, instead of continuing to socialise that cost) and towards another. In a capture situation, industry actors[[4]](#footnote-4) influence policy [makers] which leads to industry reaping private benefit that come at the expense of public interest. In the Lake Rotorua case the industry interest is the creation of a nutrient allocation market that provides the most significant polluters with the greatest amount of currency in that market.
4. The capture that occurs when regulators intervention in a market has the effect of privileging one set of producers over another, incumbents over entrants and producers over consumers is known as entry barrier capture. This risk is exacerbated when regulatory agencies overly rely on information from the community being regulated at the expense of the public [or other parties’] interests. In Plan Change 10 BOPRC heavily relies on economic and nutrient modelling owned and run primarily by the dairy industry. In the case of Plan Change 10, there are also elements of social or cultural capture, in that the legislator appears not to be fully conscious of the extent to which its behaviour has been captured.

Regulatory capture is most obviously expressed through a disproportionate influence that interest groups wield in the rulemaking process. For Plan Change 10, this is indicated in that the chosen allocation regime was largely devolved to the dairy industry to develop.

1. Policy developers should be familiar with standard capture theory, so this could be expected to be one of the assessment processes for its risks to the development of sound policy. For this plan change, where special interest capture was an obvious risk, the regulator should be able to describe how regulatory capture was recognised, avoided or mitigated. Other elements that the process and section 32 report should be able to answer capture risk are:

* At what point through the process was the potential for special interest capture identified?
* What safeguards were put in place to ensure it didn’t happen?
* Does the resulting rule regime advance the sector’s private interest at the expense of other interests, and did the sector that benefited intentionally and actively set out to achieve such an outcome ex ante?

1. Although some these risks were alluded to in the section 32 report and review of Rule 11 we can see no evidence that any of these risks were explicitly recognised, identified, avoided or mitigated. There is no evidence of any mechanisms being used to limit regulatory capture in the StAG TOR, in the Council’s section 32 analysis, or their Section 42A report or their planning report. If anything Council has acted in a way that facilitates this capture by allowing into the collaborative process:

* concentrated interest groups with a significant financial stake
* in technically complex policy areas where asymmetric information is prevalent[[5]](#footnote-5)

This should have rung serious alarm bells, as they meet two dominant conditions in captured agencies.

1. When capture has real effects, it becomes important as a policy consideration. In Lake Rotorua it serves to protect and preserve the status quo, as far as pattern of land use is concerned. This means the plan rewards those who pollute and penalises those who don’t, driving behaviour at substantial variance from that any plan or policy regime would be trying to deliver.
2. The effect of capture in Lake Rotorua locks patterns of land use into those occurring now, rather than allowing a fluid response to markets. New Zealand economic model is capitalism, whereby land use does change, based on commercial decisions of the value of various land use enterprises. This plan change seizes up the market response process of reacting to price and thus changing land use – after it has protected the incumbents. It thus contributes to inefficient use of resources and masks polluting behaviours.
3. The pattern of land use in Rotorua has existed for only somewhere between twenty and eighty years, with dairy in particular only becoming a more significant land use in the last 20-25 years. To put in context, this land use pattern considerably post-dates when CNI’s land was removed from Iwi control. The policies and rules entrench the capabilities of some. They ignore any opportunity for creating resilience for settlement land holdings. This inequitable policy regime must have some compelling reason to preferentially support or subsidise particular land uses in particular locations as it does. Attaching presently externalised costs as a value to some properties, purely because they are creating those externalities, is a form of corporate welfare for some land owners. Preferential treatment of some land owners to keep them viable in this way runs counter to NZ economic practice. The credibility of Council’s process is severely compromised when it vests very large amounts of public money to a self-selected group whose activity is the main cause of the problem.
4. A key report[[6]](#footnote-6) Council used to inform its allocation decisions identifies that some types of allocation would mean that some land owners who recently changed land use to be highly intensive may now have stranded assets. It has been evident since the 1990s that intensive farming of cattle causes nitrate pollution. Particularly cattle farmed for milk. This knowledge became even more widespread in the lead-up to Rule 11. Thus any farmer continuing to intensify at that time was gambling that some regime would intervene to protect a known polluting use, and by necessity would displace a regime that might apportion costs in a way that matched pollution outputs. Land users who argue that someone else should compensate them for stranded assets, when these were created through pursuit of intensification in the face of known risks thus not demonstrating prudential action, is unprincipled. However, this speculative approach appears to have been successful, as Plan Change 10 confirms the capacity of those land users to keep polluting and not pay for those externalities. If farming that produces high amount of N can only work because someone else is picking up the tab, it is not a commercially viable land use. Capitalism is known for “creative destruction” whereby new knowledge, new events, and new markets make some enterprises uneconomic. Stranded assets do occur. Horses and buggies, canals, analogue cell phones, and soon coal fired power stations are examples. Policy could have provided a route to move sensibly from a high polluting regime to a low one, but it certainly should not be reinforcing a capability to continue in a way that could well lead to the creation of further assets that will be stranded.
5. Governance capture of Plan Change 10 played out over a couple of years, through a gradual devolution of responsibility for policy development.
6. Initially a co-governance entity of the Te Arawa Lakes Trust, Bay of Plenty Regional Council (BoPRC) and Rotorua District Council (RDC) was established under the Te Arawa Lakes Settlement Act 2006, called the Rotorua Te Arawa Lakes Strategy Group (RTALSG). This group oversaw both the funds ($45.5m) allocated by central and local government for incentives to reduce nitrogen leaching from rural land in the Lake Rotorua catchment by approximately [originally] 200 tonnes. As modelling had identified that additional reductions would be needed to meet sustainable loads, BoPRC approved the development of rules to help meet the estimated combined reduction of 270 tonnes needed from rural land.
7. The RTALSG held a public forum in August 2012 which recommended the formation of the Lake Rotorua Catchment Stakeholder Advisory Group (StAG) to advise on the design and implementation of rules and incentives to achieve the nutrient target reductions from rural land. This Group was established by resolution of the RTALSG on 28th September 2012. It’s difficult to assess the proportionality of representation for land area which is the subject of allocation rules, as there is a degree of overlap between representation on the basis of land use and of land ownership.
8. The best time to ensure that any risks posed by using a collaborative process to make allocation decisions had rules to avoid governance capture, was in the StAG Terms of Reference (TOR). However the TOR do not identify this as a potential problem. They do not address themselves to avoiding or mitigating it. If anything the TOR facilitated such capture by actively inviting attendees from member organisations. This open invitation to participate, the only constraint being an inability to vote, enabled the professionally resourced, nationally coordinated and nationally experienced groups such as Federated Farmers and Dairy NZ to have much greater influence. For a group not invited to the table, there was no capacity to attend.
9. It’s also evident from the TOR that StAG had the scope to look broader than allocation as the policy regime and methodology for managing nutrient inputs to the lake.

*The main purpose[[7]](#footnote-7) of the Lake Rotorua Catchment Stakeholder Advisory Group (the “Group”) is:*

1. *To provide oversight, advice* ***and recommendations*** *on “rules and incentives” options that will achieve the nutrient reduction targets needed from rural land in order to meet Lake Rotorua’s water quality target. This shall include advice on implementation options and District and Regional statutory plan changes.*

*The Group shall also:*

1. ***Facilitate engagement with all stakeholders****, in conjunction with the three partners represented within the Rotorua Te Arawa Lakes Strategy Group (RTALSG).*
2. *Advise on progress in developing and implementing rules and incentives, and make associated recommendations, to improve both progress of the programme* ***and stakeholder relationships****.*

***Group advisory, engagement and reporting functions***

1. *To achieve the Group’s advisory purpose, it will:* 
   1. *Work with staff from the RTALSG partners* ***and invited experts to investigate rules*** *and incentives options and implementation options, assess their merits, rank options and make recommendations to the RTALSG and its partners;*
   2. *Develop guidelines to evaluate rules and incentives options.*
2. *Individual members of the group* ***shall engage with their respective agencies and sectors*** *to ensure a two way flow of ideas and feedback on draft advice and other relevant matters.*
3. *The Group may occasionally* ***seek broader stakeholder input*** *by convening a stakeholder plenary or by other appropriate means. This engagement shall be done in conjunction with the RTALSG partners.*

*10. Membership was as follows:*

|  |  |  |  |
| --- | --- | --- | --- |
|  | **reps** | **land area affected**  **% + Ha in catchment**  **(50060 Ha ex lake bed)** | |
| **15 members making land use policy recommendations** | **0** | % | Ha |
| BOPRC (local elected member) | 1 | 0 | 0 |
| Rotorua District Council (elected member) | 1 | ? | ? |
| Te Arawa Lakes Trust | 1 | (Lake bed) 0 | 0 |
| Lakes Water Quality Society (LWQS) | 2 | 0 | 0 |
| Lake Rotorua Primary Producers Collective (LRPPC) | 5 | 10  33.1 | 4982  16571 |
| Dairy |
| Drystock |
| Maori Trustee | 1 | 6.8 | 3436 |
| Forestry sector, (mainly land tenant) | 1 | ? | ? |
| Maori landowners | 2 | ? | ? |
| Small block owners | 1 | ? | ? |
| + |  |  |  |
| and any other bona fide stakeholder group subsequently agreed by Group consensus. | 0 |  |  |
| **CNIIHL** | 0 | 6.4 | 3200 |

1. *Group members shall be selected by their respective sectors and agencies (as per Clause 10 [table]) on the basis of the knowledge and skills they can bring to the table, particularly an ability to operate in a collaborative manner.* ***Staff from member organisations may attend and take an active part in Group discussions****.* [i.e. facilitating capture.]
2. When the Rule 11 suite were developed in 2005 there were 100 properties over 70Ha. It is unlikely that this number has changed substantially, so it is quite mystifying why a landowner with 3188 Ha in the catchment was not represented in the collaborative process to develop the new policy. There appears to have been a collective blindness by Council and in StAG to CNIIHL being a landlord, not a forester. And not necessarily having the same land use goals as their present licensee/lessee. This is despite their licensee/lessee pointing this out at the first StAG meeting. CNIIHL is not represented by Te Ture Whenua Maori Land interests, nor Te Arawa Lakes Trust, nor the Māori Trustee. They have all advised that they did not see the settlement land owners as one of their stakeholders. The absence of any consideration by Council and the collaborative stakeholder group, of CNIIHL as a landowner affected by the allocation policy, perpetuates the injustice that the 2008 settlement was intended to remedy. The CNI 2008 settlement is for lands wrongly taken. Those lands were returned in 2009, only to immediately be subject to a constraint to any alternative use. That constraint, driven by the historic land use, has not been under the control of the land owners.
3. After accepting these TOR, StAG then further devolved its role by accepting a rule framework that the Lake Rotorua Primary Producers Collective (LRPPC) developed, in 18 June 2013. The LRPPC’s self-described purpose is: *“To* ***influence*** *policy and farm practice that enables profitable farming, a prosperous community and a healthy lake”. The group seeks to* ***advance the interests of rural landowners*** *facing major reductions in nutrient losses from their farms*”. In which they have been very successful. Had a polluter pays approach been used, the LRPPC would be the most negatively affected by rules to address this pollution. It would have caused them to pay for at last part of the externalities they have up to now been socialising.
4. The LRPPC group worked closely with pastoral industry advocates to come up with a regulatory framework for allocation of nitrogen to various land users in the catchment. I.e. the preparation of the policy response was devolved to a subgroup of StAG, made up of those contributing the most pollution to the catchment, and their advisors. This subgroup appears to have relied heavily on work done by the Dairy NZ team of Parsons, Doole and Romera “On-Farm effects of diverse allocation mechanisms in the Lake Rotorua catchment” to identify the economic value of various land uses and various mitigation options. This further relies on a paper prepared by Adam Daigneault and Hugh McDonald “Evaluation of the impact of different policy options for managing to water quality limits”. I have read the Doole evidence not these two contributing papers, but I note that in Doole’s evidence the methodology to assess forestry profitability and that to assess pastoral farming profitability employ two very different mechanisms. Forestry (para 31) uses an internal rate of return method (IRR), which means that all costs are included. Land price and any infrastructure and its depreciation are all costed in. The pastoral assessment (para 16) has been done on earnings before interest and tax (EBIT) which is blind to the capital structure of land and infrastructure. This will distort the relative value of these two land uses, and generally result in over-weighting the value of pastoral use.
5. RTALSG devolved the policy development to the StAG, who devolved it to the LRPPC, who in part devolved it to professional industry representatives from the dairy sector. This left wide open the risk that the policy recommendations reflected the needs of the group who held the pen. By contrast, for a party who had no representation on StAG, no representation on LRPPC and no professional industry body, the outcome was predictable. Despite being advised at the first meeting that a significant landowner was not at the table, and StAG reaffirming that the rules were targeted at landowners mid-way through the process, no attempt was made to bring CNIIHL to the table.
6. The Rule 11 benchmark was used as the Plan Change 10 benchmark. The latter, developed in the period 2012 to 2016, locked any land with a forest on it into a nitrogen loss limit of 2.5kgN/Ha. This swingeing limit is such a constraint that it prevents the land being used for anything other than forestry, as all other land uses would potentially leach a greater amount of nitrogen. Meanwhile, those who refused to participate in the original benchmark exercise, whose land is now being used for dairy farming, have been given a retrospectively assessed benchmark of 125kgN/Ha.
7. As part of the plan construction Council is setting in place a purchasing and trading system for nitrogen. For 5 years this will involve purchasing nitrogen to remove nitrogen from the system. They will purchase nitrogen units at a rate of close to $400/kg for nitrogen permanently removed from a farmer’s land use capacity. In 5 years’ time the plan rules will allow nitrogen trading between willing parties. Council has modelled this price at $200/kg.
8. This means that someone with a dairy farm has been gifted N at a value of somewhere between $200 - $400/kgN for where N leaves the soil root zone (roughly half their Nitrogen Discharge Allocation (NDA)). Our understanding is that although the start point may be as high as 125kg/Ha for a dairy farm, it is put through a correlation process to match the latest version of the Overseer model and the owner must demonstrate /use a 40% drop from the start point of [say] 125kgN. The number used for calculation would therefore be in the order of 72.5kg/Ha of NDA. A worked example on a nominal 100 Ha farm, to change from dairying to forestry would give them cash in the order of **$1,450,000** (75kgN/Ha dairying less 2.5kgN/Ha forestry = 72.5kg/Ha x 100Ha x $400/T x 50% attenuation). Or effectively cash in the bank to trade later of $725,000 (presumed value of $200/kg).
9. Land planted in forest at the time the Rule 11 benchmark was set constrains the land owner to forestry. For land capable of being used for dairying (in a Land Use Capability sense) but planted in forest at the time the rules came into effect, the land not only forgoes the “cash-up” option. It would also require the purchase of nitrogen units if they want to use the land to its capability. The rules make no provision for that, except as a non-complying activity. The rules also prevent this happening until 2022, because trading is embargoed until then. Someone unfortunate enough to have 100Ha of Class 3 land covered in forest between 2001 and 2004 are thus starting somewhere between $715,200 and $1,430,400 below zero, for exactly the same land as a dairy farmer has. I.e. the value difference is not $1.4m, it is $2.8m (the value not given AND the value that must be purchased). This land users other option is to give in and accept that the nitrogen constraint on their land will mean their land value drops to that of forestry land. i.e. they lose all optionality.
10. The Telfer Young report on land values in Lake Rotorua priced dairy land in the catchment in 2014 at c. $24,000/ha and forestry land c. $3000/ha. The report identifies that it expects that Nitrogen discharge allowances effectively become part of the land value. CNIIHL has 600Ha of land capable of being used for dairying (LUC 3 and 4). The land value loss due to the Plan Change 10 grandparenting allocation regime is thus in the order of $12m. The August 2015 StAG meeting minutes record: *Leases: it is clear that NDAs, like current Rule 11 benchmarks, are part of* ***a landowner’s property right*** *i.e. owned by landowner*.
11. Council misrepresented CNIIHL as a forester throughout this process, and despite advice from CNIIHL over an extended period to the contrary, it is something they have continued to do.
12. Our next line of enquiry was to see whether Council instead dealt with CNIIHL via its obligation to consider section 8 of the RMA, for the CNIIHL Forests Iwi Collective Deed of Settlement 2008. The section 42A report component that covers RMA section 8 focusses entirely on the Te Arawa Lakes Settlement of 2006. No mention is made of the CNI Settlement Act. Council’s analysis of the effects of the rules on under-developed land say this about adverse effects on CNIIHL:

*The Crown has also been involved in the process of setting targets for reduction and providing public money to ensure that the required reductions are met. Staff are unaware of the Crown’s settlement negotiation basis in reaching the particular settlement agreement it did on the Central North Island forests. It is assumed due diligence processes would have identified any restrictions on land use that would influence value. (Para 146 S42A report)*

1. This approach is all the more baffling because the CNI settlement is a mere two years after the Te Arawa Lakes Settlement, which has driven much of this plan change and for which the section 8 analysis is comprehensive.

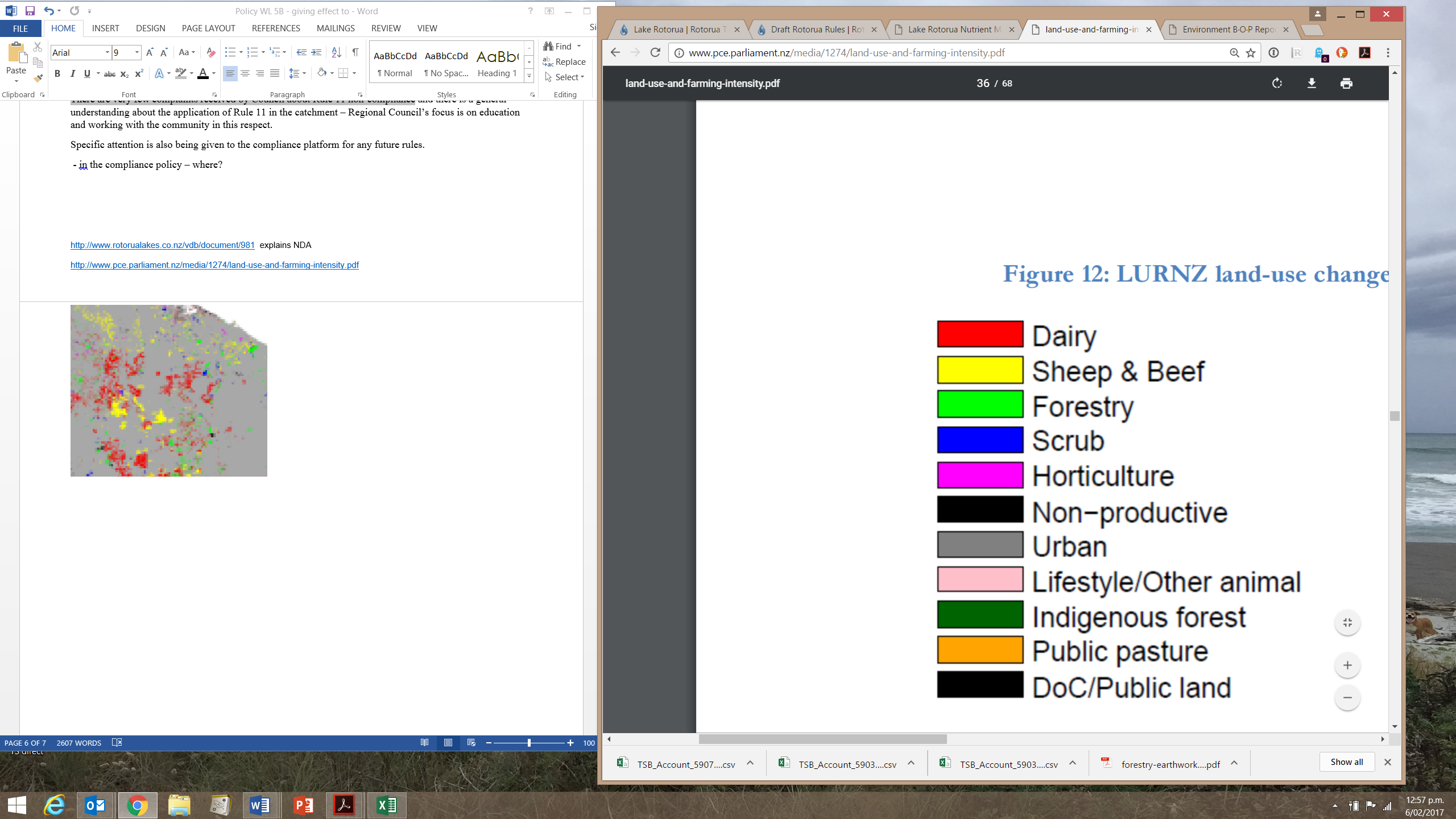
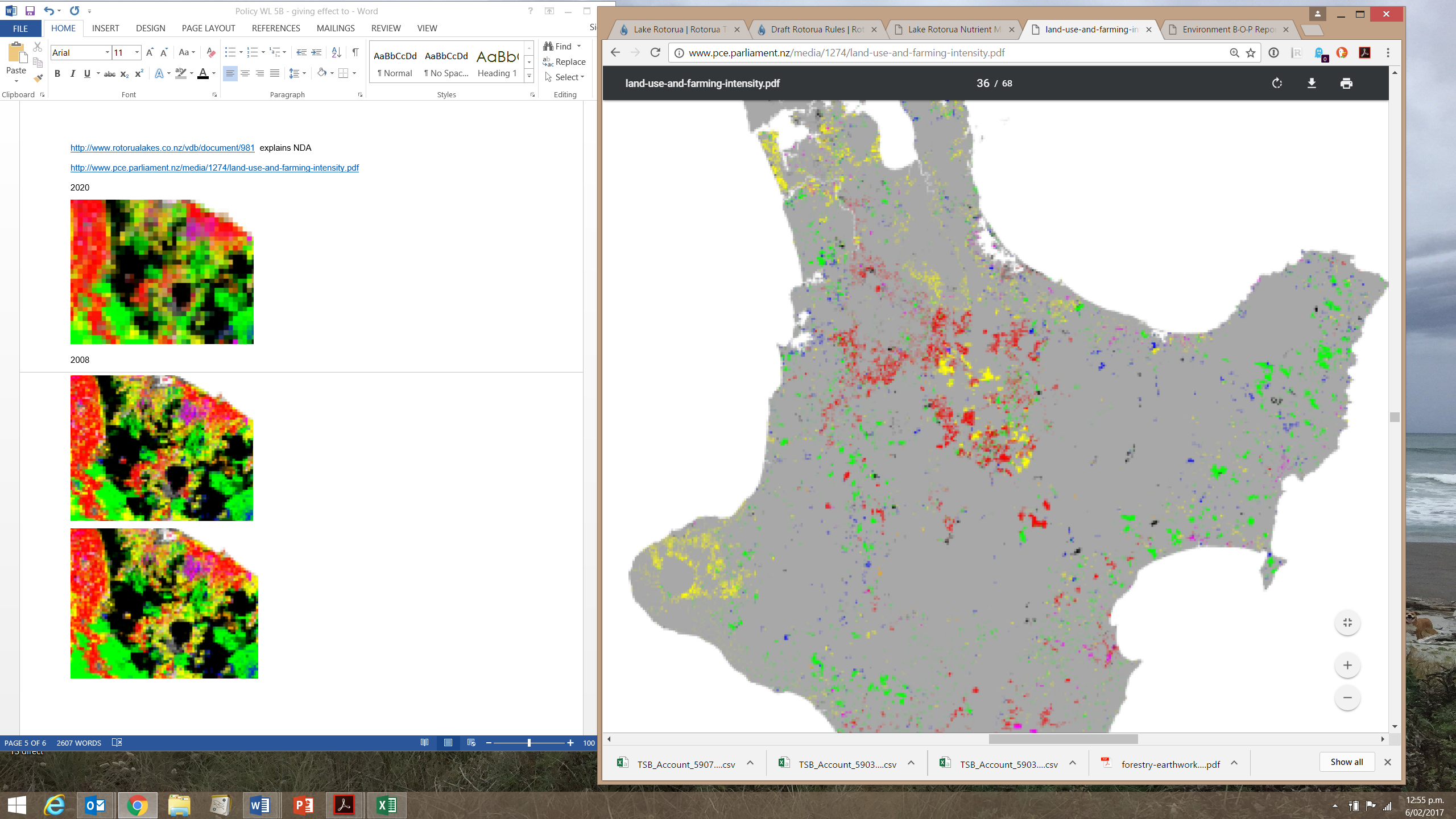
# **Policy Development logic**

1. Council explained that a new[[8]](#footnote-8) set of rules are required because the nitrogen reductions needed from rural land and pastoral inputs are well beyond what voluntary adoption of good practice can deliver.  It identifies the entire nitrogen input reduction required are in the order of 320T/yr of which 50T can be reduced through urban and engineering options and the remaining 270T must come from change in practice on rural land. Council believes that rules to limit nitrogen loss from pastoral land are required.
2. Plan Change 10 policy design appears to have relied heavily on the 2009 Motu report*[[9]](#footnote-9)* to set the policy regime at a conceptual level, and to set out the details of that policy regime. The report briefly introduced concepts such as polluter pays, the value of any allocations, and polluter’s property rights. The Report’s argument very rapidly narrows down to choosing allocation over fees and using an allocation regime based on grandparenting. It does point out a number of risks associated with allocation, such as the risks to a system that must respond to a change in a cap, which may occur as a result of changes in scientific understanding or to deal with vintage nutrient flows. It characterises this risk and suggests that to mitigate it some allocative capacity should be reserved for vintage or unaccounted N. It also identifies the risks of “strategic behaviour” by participants. Others might call this “gaming the system”. It clearly identifies that there are a number of reasons behaviour will not be driven toward reducing pollution but instead will be driven to preserving individual or sectors’ position, especially regarding trading. It does not look at these aggregate effect of these risks (e.g. imperfect information, imprecise information, sticky markets, significant wealth transfer or gaming) to test their net effect against the functioning of an allocation system. If they had, this aggregate effect would have shown allocation was so seriously flawed it would have to be regarded as a non-viable policy regime.
3. The Report does point out some important wealth transfer considerations, which should have raised alarm bells for those setting up the allocation regime. It does not identify that this cost is being disproportionately borne by those whose land is capable of “higher and better” use, but whose land is not being used to its optimal level. A sample of the wealth transfer issues are:

* *If stringent environmental targets are chosen, allowances will be valuable and allocation rules will* ***alter wealth significantly****. Any rules for sharing costs and allocating allowances need to be relatively simple and transparent so they are easy to implement and will be perceived to be fair.*
* *Costs are likely to* ***affect the values of different land parcels*** *so a disproportionate amount of cost will be borne by those who own the land or other affected assets at the time when the regulations are created.*
* *Free allocation of nutrient allowances is the key instrument for* ***moving costs away from those who would otherwise bear them*** *by directly funding mitigation actions, losing profit through constrained production or through tax incidence and capitalisation of losses. Once a cap is converted into tradable allowances, those who receive them hold* ***a valuable asset*** *and those who need to buy them* ***face an additional cost****. Thus the questions of how allowances are initially allocated … are critical to the final distribution of net costs.*

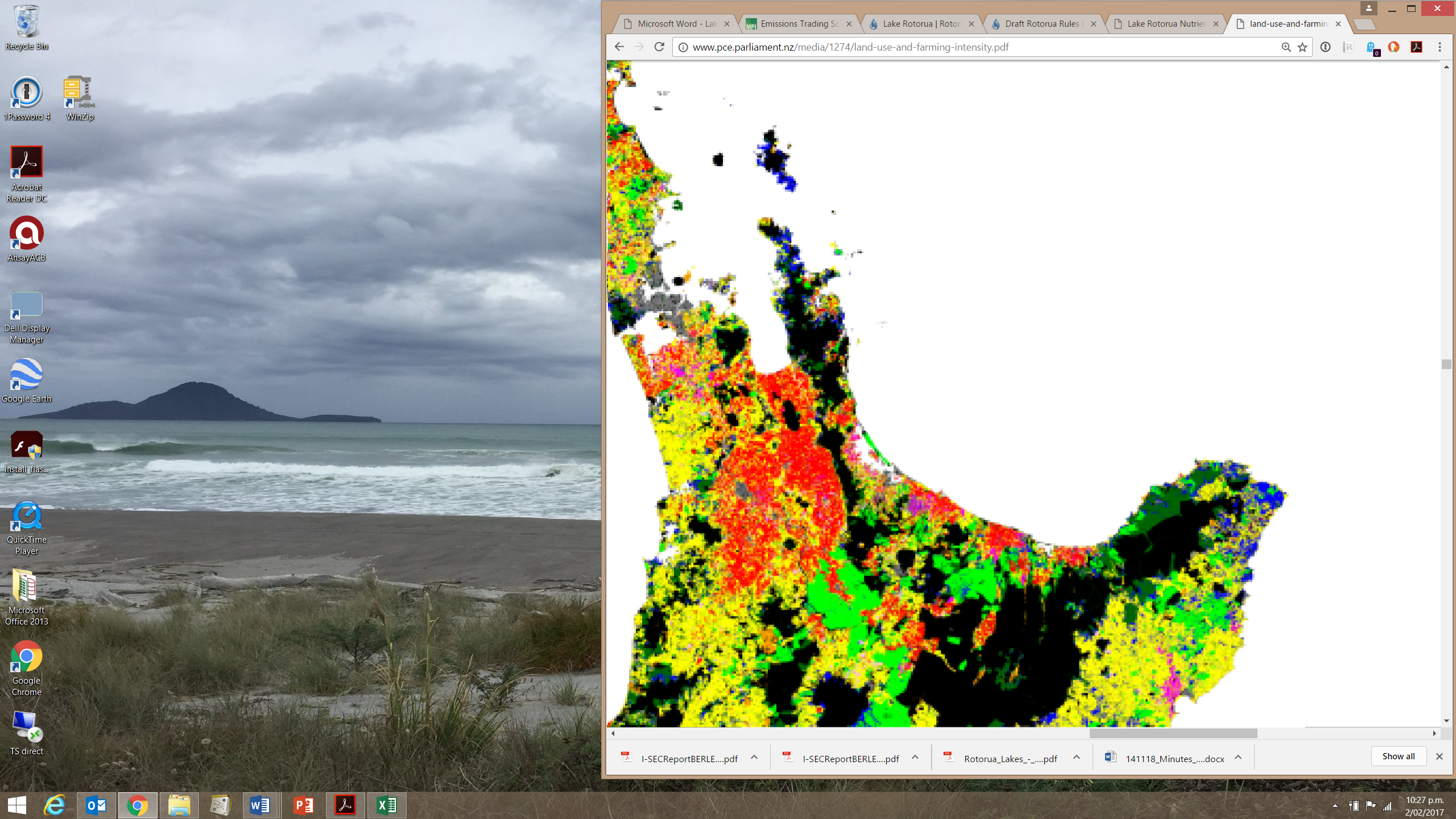
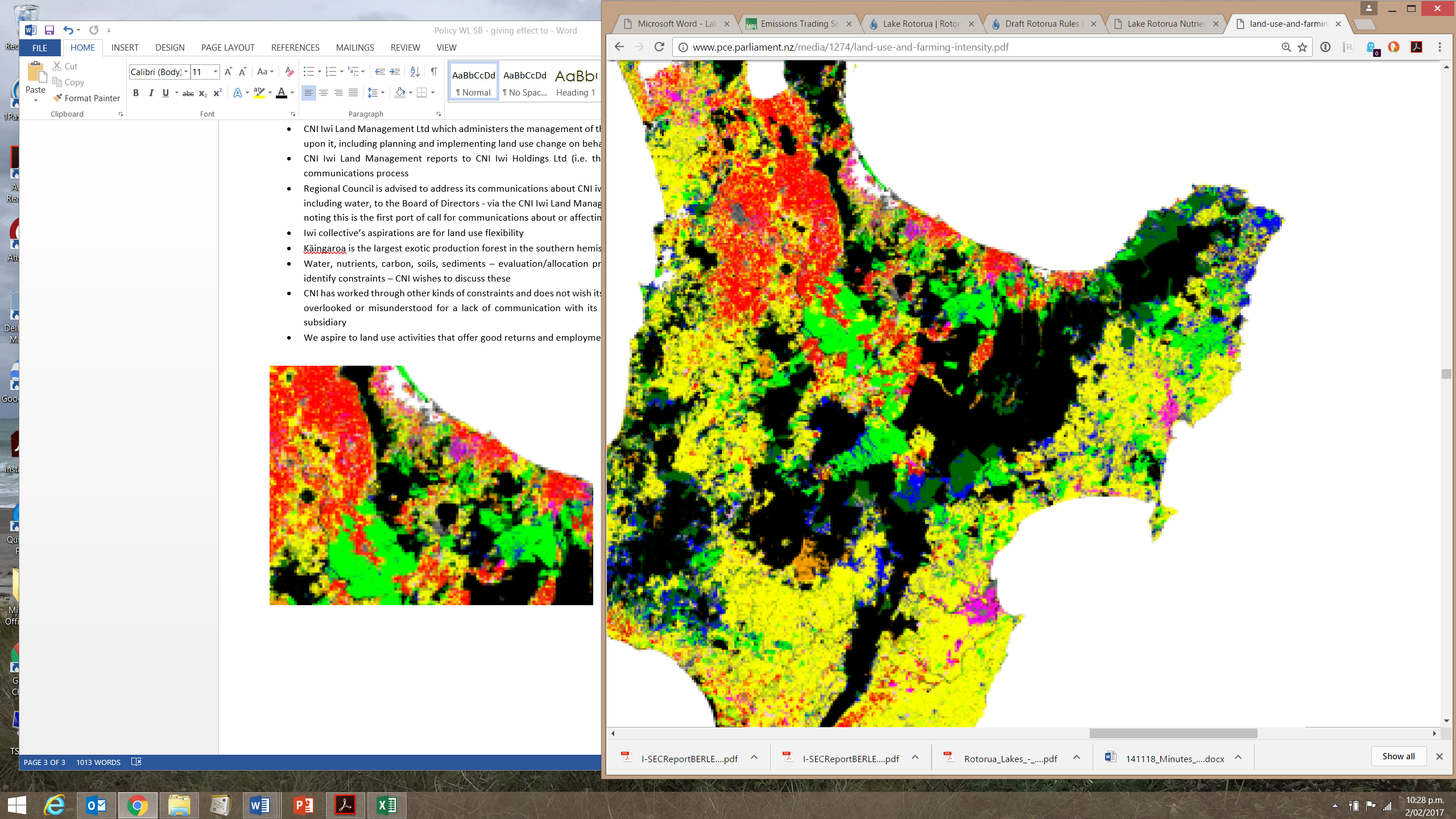
1. It was made abundantly clear in the section 32[[10]](#footnote-10) report for Rule 11 and the 2009[[11]](#footnote-11) Efficiency and effectiveness review, that the approach used for Rule 11 was only ever seen as a stop-gap or interim measure to avoid increase in nitrogen emissions by “holding the line”. Despite this, Plan Change 10 builds directly on the grandparenting approach of Rule 11.
2. The change in land use between 1996 and 2008 can be seen in Figure 2.

### Figure 2 Change in land use between 1996 and 2008



Lake Rotorua

Actual 2008 Actual 1996



1. It is clear that a significant amount of land was converted to dairy in this period. There was very little benchmarking. There was no compliance assessment, so there would be no way to tell whether intensification occurred. Interviewees for the review of Rule 11 certainly thought it had:

*It is likely that the only land use changes that will come to attention will be the more significant and visible changes. Gradual intensification (and therefore increased nutrient export) will be less likely to be captured.*

Given that all agricultural advice at the time was to increase per hectare production it would seem plausible that this also happened in the Lake Rotorua catchment. In the period that Rule 11 was in force, **areal extension** by high polluting enterprises did occur and **intensification** of high-polluting activities is likely to have occurred.[[12]](#footnote-12) Rule 11, based on the use of benchmarking, was not effective in stalling nutrient discharges.

1. After confirming that all interviewees understood that Rule 11 was intended as an interim measure only, the Review of Rule 11[[13]](#footnote-13) makes a number of suggestions to improve the outcomes for any future policy development on this subject. It would seem appropriate that these would guide further policy development attempting to improve lake water quality. The review provided these observations and advice:

* *Has Rule 11 equitably managed land use activities and land development opportunities within the catchments? Pg 36. The short answer is ‘no’. Rule 11 creates inequity in the primary production development potential that is available for undeveloped or under-developed land compared with established intensively farmed properties. This was highlighted by all Key Informants as a negative feature of Rule 11 and needs to be addressed.*
  + - *The known inequities created by Rule 11 in particular, the aspect of Rule 11 which ties permitted land use for to recent productive use rather than land use capability or best practice land management need to be addressed*. [i.e. the Review resiled from grandparenting or sector averaging.]
    - *To address the concern that Rule 11 is not sufficient to address […] water quality degradation, consideration should be given to engaging with landowners and the community about reductions in nutrient export. Any options explored* ***should consider the economic drivers*** *that actually influence land use change and the need for close integration with District Plan controls.* *Rule 11 alone, does not address the true economic drivers that influence decisions made by landowners about how they use their land.*
    - *Clear parameters for benchmarking are needed where there is nil or little historical information on a property’s land use practice.*
    - *Benchmarking should be completed as an urgent priority, especially on larger nutrient export properties.*
* *The lack of enforcement of the benchmarking information requirements of Rule 11 has created inequity between those land users who have already complied with benchmarking requirements and those who have not.* 
  + - *To enhance the efficiency of implementing and enforcing Rule 11, a strategy should be devised to enable ongoing monitoring and verification of actual land use practices compared with recorded nutrient benchmarks.*
* *There was some scepticism about whether Rule 11 can eliminate artificially inflated nutrient benchmarks and whether it can consistently capture gradual marginal increases (‘creep’) that occur in on-farm land use intensity.*
  + - *To facilitate material change in land use that will reduce nutrient export, better integrated Regional and District Plan rule frameworks. Opportunities need to be explored to provide genuine flexibility in terms of the range of land use alternatives to nutrient-exporting practices. Incentives also need to be considered – both to reward best practice land management and voluntary mitigation measures and to positively influence decisions about land use change in the shortest time possible*.

1. The reviewer’s clear messages that grandparenting was very inequitable, ineffective, and inappropriate in achieving behaviour change continued:
   * + *The differences in land development restrictions that are created by the benchmarking requirement of Rule 11 are potentially significant. Regardless of the number of properties affected, the constraints create economic restrictions that potentially affect different sectors or socio-economic groups differently (or disproportionately). The potential for inequity in the degree to which Rule 11 constrains future property development was acknowledged in the cost benefit assessment undertaken in developing Rule 11*[[14]](#footnote-14)*.*
     + *Potential inequity arises for multiple Maori owners landholdings or land held in trust and leased under long-term lease arrangements in two ways:*

*Firstly, where land has not been developed intensively and has had a low nutrient export relative to more intensive land use practices, Rule 11 gives no ‘credit’ for the extent to which the property has not contributed to nutrient export historically.*

*Secondly, Rule 11 prevents intensification of the land to the same level as other land in the catchment and thereby constrains future economic opportunities. In other words, properties that have had the advantage of economic development (with consequent effects of nutrient export) are able to continue to enjoy that advantage but those that have not are denied it.*

* + - *Where Rule 11 constrains multiply-owned Maori ancestral land in this way, and to the extent that it prevents reasonable use and development of land, there is a question as to whether the rule framework properly recognises and provides for the relationship of Māori with their ancestral lands and properly applies the principles of the Treaty of Waitangi as required by sections 6 and 8 of the RMA. The Study Team considers that this feature of Rule 11 requires urgent review.*
    - *Council re-visit the aspect of Rule 11 which ties permitted land use to recent productive use. The Council could consider identifying and recognising in the rule framework the benefit that derives from low nutrient export from areas of land that are undeveloped or are in indigenous or exotic forest or are developed to low intensity compared with the land’s capability; and consider how nutrient export allocations might be assigned to such land to enable development on a more equitable basis with other developed land in the catchment. Any adjustment to account for this inequity should ensure that the management of nutrient loss from land seeks to reduce it where it is high and set it at levels commensurate with best productive practice compared with other good practice within the catchment.*

1. The review identified that Rule 11 created severe inequities. The review also identified that implementation of Rule 11 in the Lake Rotorua catchment had been poor. Almost no benchmarking had occurred, making it impossible to check compliance. It was therefore not possible to confirm whether the policy had been effective.

*Interviewees highlighted a number of common shortcomings of Rule 11 including, in particular, the incomplete progress with benchmarking, the inequities the rule creates and the long-past due date for benchmarking and lack of enforcement of the rule.*

*The deadline of 31st December 2005 for supply of nutrient benchmarking input data has long passed. Very few landowners have volunteered the information required. No enforcement proceedings have been issued against any landowners to require compliance with Rule 11’s information requirements.*

*As a result, there is no comprehensive understanding of the baseline nutrient exports from land in the catchments of four of the five lakes. [*Lake Okaro is the exception*].*

[there was]“*no evidence that Rule 11 has, during the 5-year period that has elapsed [2005 to 2009] acted to cap nutrient exports from land*…” .

1. The Plan Change 10 Section 32 report, despite having no supporting evidence and instead having evidence that points to the contrary, comes to a different conclusion about the efficacy of Rule 11:

*“Intensification of pastoral farming in the lake catchment has been constrained by benchmarking under Rule 11”.* (para 35)

1. As far as the inequity created by a grandparent-type approach, the 2014 Lake Rotorua Draft Nitrogen Rules Consultation Report[[15]](#footnote-15) is deja vu all over again. The main feedback included:

* *concern that the proposal gives an unfair advantage to the highest nitrogen dischargers whilst placing restrictions on activities not contributing to the problem.*
* *importance of positively recognising and accounting for both land use capability and responsible environmental land management decisions.*
* *More than ¾ of the respondents did not support the suggested approach to allocate nitrogen to land use. People felt that the low nitrogen discharges would be subsiding the high nitrogen dischargers. They disagreed with sector averaging and grand parenting and considered the allocation should be on land use capability (natural capital).*
* *The vast majority of respondents said they would prefer an alternative method. Suggested methods included: purchase land; improve management information; different levels of allocations for lifestyle block; single fixed pastoral average; land use capability (natural capital); and promoting other forms of fertiliser.*

1. As discussed earlier in this evidence, the negotiations and policy development were with a very small subsection of stakeholders, nearly all of whom had significant amounts to gain if the policy were designed to accommodate their particular concerns. Council goes on to explain that the existing rules will not meet 270 tonne reduction target, based on experience so far with Rule 11. It misrepresents what Rule 11 achieved:

*Rules were introduced in 2005 which ~~capped~~* had the purpose of capping *nutrient losses at their 2001-2004 levels.* [*Rule 11*](http://www.rotorualakes.co.nz/rule-11)*, set a discharge limit called a benchmark for properties in the Rotorua surface water catchment based on each property’s land use between 2001-2004. Rule 11 didn’t reduce nitrogen levels to the lake, ~~but stopped nitrogen inputs to lake increasing~~.* Not proven.

1. In the face of this overwhelming distaste for the variant-on-grandparenting that sector averaging is, and the evidence that it would create the wrong behaviours, it is not clear why Council persevered rather than taking a zero-based approach to rule design. The explanation for the regime choice only points to fact that the subgroup of StAG (the LRPPC) developed an allocation framework (but did not consider any alternative methodology), and that they developed their own criteria set that supported that framework:

*The allocation methodology is built on sector averaging with ranges – based on Rule 11 benchmarking as the start point. This option was preferred by StAG through the workshop process[[16]](#footnote-16)*.

*… the decisions on allocation were made in relation to an approach that evolved over time and that considered a range of alternatives with any allocation methodology that did not accord with the sustainable lake load, allocation principles or Integrated Framework being discounted.*

*Staff have reviewed the relief sought. The relief raises these fundamental issues: a reallocation of nitrogen undermines* ***the agreements that have been reached*** *on sector allocation and the basis of the NDA allocation* ***that stems back to the grandparenting and Rule 11 benchmarking process****.*

[The Otoroa agreement settled an RPS appeal which mainly affected the timeframe for reduction]

*Reallocating nitrogen amongst sectors would depart from the way in which Council has* ***negotiated and worked with the community and stakeholders*** *to date to identify an appropriate allocation methodology, and in developing the integrated framework. (*S42 report paras 141 - 143*)*

1. Those designing Plan Change 10 considered that they were constrained to using an allocation regime rather than a fee regime, because they had a confirmed pollution cap to work to. They did not identify that a regime that requires accurate allocation of a resource to the extent that it has priced it can only do so if it has sound and certain information. If it only has rough data with huge uncertainties it can’t allocate units of this using a price mechanism. I.e. 25kg/ha +/- 8kg/Ha can’t be translated into a price per kilo of N. The tools available to characterise nitrogen inputs, processes and outputs for Lake Rotorua (principally Overseer) provide information with a high degree of uncertainty. The Overseer owners describe this uncertainty of the Overseer model thus:

*Quantifying and accounting for sources of uncertainty in models is particularly challenging, especially for a model describing complex farm systems like OVERSEER. A report by Ledgard and Waller (2001)2 estimated uncertainty of 25-30% for model predictions for N, which has since been widely quoted. However, this estimate didn’t include errors associated with measurements, or uncertainty from data inputs, providing only part of the full picture of quantifying uncertainty, and is therefore limited.*

*Since 2001, the OVERSEER model has had a number of changes, which likely result in a different uncertainty estimate for the current model version. An updated uncertainty analysis would be useful; however, quantifying all sources of uncertainty involved in the N leaching value produced by OVERSEER is impossible.*

This low level of precision makes it in appropriate to allocate based on Overseer results via a financial market mechanism.

1. The Act requires rules to provide certainty. The Plan Change has precise water quality parameters that are to be achieved in a precise number of years, a precise aggregate level of reduction in nitrogen input and precise quantities of reduction required from each landowner. Although the plan is precise in its objective, there is considerable scientific uncertainty about: the actual quantity of nitrogen presently entering the lake; whether the reduction proposed in the Plan Change reduction will be sufficient to return the Lake to a TLI of 4.2; and whether nitrogen leaching can be adequately capped. The Overseer model cannot be finely calibrated. It has a large margin of error. And, until all properties in the catchment have their nitrogen outputs modelled, the gross contribution can only be an estimate. Once modelling is completed it can be considered an approximation.
2. The Plan Change requires that the amount of N produced by each land user is modelled, using the model Overseer. Due to the imprecision of that model, the quantum of N input to the Lake is imprecise. Consequentially the amount that is to be removed can only be imprecisely assessed. Added to this is imprecision is whether the assessment of the reduction to 425T, modelled via ROTAN which uses Overseer as an input, can adequately represent the actual amount to be removed. This level of imprecision requires that monitoring and feedback processes are used, that verify and validate the model. That way the allowable amount of nitrogen leaching can be adjusted to match and reflect the actual monitoring results.
3. In the case of Lake Rotorua there is a long lead time between the leaching of nitrogen and its appearance in the lake, so a feedback mechanism that considers this need to adapt would be required. When there is a huge and unknown error factor it is inappropriate that Council creates a regime that tells landowners that it is acceptable to manage their land such that a certain level of nitrogen is leached from it, and they can trade the nitrogen they do not need. Where the entire total and/or the proportional input to that total are likely to change as a result of better information, this requires that the response must be able to adapt to the needs for pollution reduction. If an allocation regime is used that would meant that the total pool to allocate and the proportions allocated to each landholder would need to change. Adaptive management and allocation are not compatible.
4. Regimes based on Cap-allocate-and-trade, and pollution fees both use price incentives to get land users to change behaviour and reduce emissions. Council needs to consider what the benefits, risks and behaviour that using a charge (a price instrument) or a cap-allocate-and-trade scheme (a quantity instrument) are.

**A charge regime**

1. A charge on each emission unit gives emitters an incentive to reduce emission whenever that would cost less than paying the charge. The quantity reduced depends on the level of the charge, so getting the charge level right is crucial. Too low and emitters opt to pay the charge and continue to pollute. Too high and it is also sub-optimal for business and the wider economy.
2. With a charge, the price of emitting a unit is set, but the total quantity of emissions is not. A charge provides price certainty (at least for the immediate future) for each emission unit. Charging works well to establish an emission reduction trend, but doesn’t directly set the end goal. Emissions quantities would therefore be tracked, to see the trend and its trajectory. If necessary the unit charge price could be re-pitched[[17]](#footnote-17) to keep the emission reduction trajectory going. Charging allows for responses to changing information, and is a much more appropriate option for managing under uncertainty. It is compatible with adaptive management.
3. The cost distribution for reducing emissions with a charge is that there is an immediate cost for emitters to pay per emission unit, causing a bigger initial hit to the balance sheet of high-emitters. Council could create a transition to bridge this gap to assist high emitters get used to paying the full cost of their business. They could use a progressive system e.g. no charge for very low emissions 0-5 kgN/ha, moderate charge for 5-25 kgN/ha, higher charge for kgN >25. The charge could be set by assessing the costs associated with controlling that emission (mitigation costs) and clean-up costs associated with each unit of emission. It also lends itself to a rebate system for mitigations.  Overall the compliance costs for charges are also lower than for cap-allocate-trade, and raise the possibility of a double dividend from using revenues from environmental charges, which produce the first environmental dividend, to reduce other distortionary charges through revenue recycling, producing the second charge efficiency dividend. Assessing the value of a charge scheme should therefore also consider the revenues.
4. The behaviour a charge system drives is pollution reduction, as all focus is on driving the cost down.

**A cap-allocate-and-trade regime**

1. A **cap-allocate-and-trade** regime, such as Plan Change 10 proposes, sets the maximum emission quantity in advance and distributes [emissions permits](http://www.guardian.co.uk/environment/2011/jul/05/what-is-emissions-trading) within that envelope. Setting a [cap](http://www.guardian.co.uk/environment/2011/jun/07/ets-emissions-trading) on the overall emission quantity creates a price on emission units that is distributed to emitters via an initial allocation, or through [trading](http://www.guardian.co.uk/environment/2011/jun/07/ets-emissions-trading) with other emitters. Trading is a necessary component, so the mechanics of a trading regime to create an efficient, transparent market are also necessary. The permit trading price will fluctuate, depending on demand. For land use emissions the land use mix and within-sector variance will also be relevant. Emission units will change land value.
2. Tradable permits place a premium on *accurate measurement of the initial problem*, and of how it changes over time, as adjustments can be costly either in terms of compensation or through undermining the property right (because such permits are property rights, even though they fall short of fee-simple title). The effectiveness of permits can also be affected by factors such as the liquidity of the market, the quality of the property right, and the existence of market power[[18]](#footnote-18).
3. Cap-allocate-and-trade provides certainty about the quantity of emissions (cannot exceed the cap), but does not provide certainty about the cost of achieving these reductions. Where there is also uncertainty about quantity of emission reduction required this further affects the ability of an allocation regime to function. Having a situation where we don’t know whether the cap is accurate and thus the quantum allocated per farmer is correct, or how much it will cost to get there.
4. The cost distribution for reducing emissions for cap-allocate-and-tradeemitters in the early stages of the scheme is often to only pay for any extra permits bought from other emitters – not for the initial tranche permits have often been given out ("grandparent"). Grandparenting supports cheaper compliance for status quo and is popular with higher emitters. All but grandparenting require trading capability to commence immediately, or there will be significant business disruption. Cap and trade via grandparenting is better for near-term business profitability, but it is less likely to be the best outcome for society. It rewards high levels of emission, discourages innovation and creates no revenue stream to remedy past damage or better characterise the problem. Such a system sets up not only an expectation, but also a property right to that pollutant. This creates a number of distortions to the system and often drives behaviour completely contrary to the intent of the policy. Downward adjustments from that point would be more difficult than they are now, because the pollutant has a monetary value. As this is attached to particular land parcels this also affects land value. The net effect is that it is a tradeable right and becomes embedded as a property right.

The behaviour cap-allocate-and-trade drives is “rivalry for resource” because all effort is on how to accumulate the most capacity for your sector or yourself.  This includes delaying pollution-reduction action if that would serve to sustain their allocation. Once N becomes an asset, landowners will want a return from that asset. So the behaviour of landowners that are allocated N is economically motivated e.g. if a landowner has temporarily a surplus of N (for whatever reason), they will look to lease that N to someone who may need N on a short term basis resulting in farmers “farming to their cap”. Such behaviour is already occurring in Taupo, where surplus N is being leased[[19]](#footnote-19). This will not be happening in Rotorua at the moment, as the N required by farmers will vary on an annual basis depending on a number of factors e.g. changes in stock classes, fertiliser use, feed levels, rainfall etc. If farmers discover a means to reduce N leaching e.g. N inhibitors etc., the economic rationale would be to intensify the farming operation to maintain farming at the cap, rather than to reduce N leaching. Cap-allocate-and-trade thus does not provide any incentive to reduce N leaching and will not be directed to achieving the objective of improving water quality but instead lead to perverse environmental outcomes.

1. Should Council reappraise its policy regime and instead use a charge system, it would need some method to calculating N output to form the basis for fees.  A charge system does not demand the accuracy that an allocation system does, as fees can apply to a band of discharge rather than a single number. A far simpler model than Overseer could capture inputs likely to drive N release. It could be based on stock density, number, size, and sex and the N content of the feeds, or the extra N inputs that allow for stock numbers to remain high would be captured slightly indirectly with the stock numbers and weights.  A simpler system is likely to more accurately represent actual knowledge about the system. There is no point having a finely grained model that requires very detailed inputs if it is making broad assumptions. Better to have a coarsely grained model that gives a valid approximation. However, because a fee regime doesn’t need to be as accurate as an allocation regime, if pressed, Overseer could work.

**A charge regime for Lake Rotorua**

1. Lake Rotorua nitrogen issues could lend themselves to a charge approach, putting a regime in place that would set a trend in the desired direction and measure progress, rather than set a fixed target now that is based on poor data. The first phase could introduce some obvious improvements to practice, and use a charge process to keep that moving along.  To make targeted/useful/ meaningful changes requires better information - matching activities to effects, identifying costs and values across industry groups using a standard methodology, and getting better attribution information.  The charge approach was ruled out by Council because of the lack of goal certainty it offers. However the allocation model that Council has pursued has serious limitations because of the lack of accurate input to goal certainty, on the basis of workability the allocation approach should have been ruled out.
2. Council has dismissed charging out of hand, without investigating: what it might be set at e.g. it could be progressive; how transitions in level of charge could drive behaviour (e.g. punitive at high per ha levels, none at low levels); how to divorce it from political interference (using a formula approach e.g. like rent reviews on leasehold land); or how it could be used to drive behaviour in the right direction, and how to tune it to meet targets. Instead Council have spent millions on finessing a deeply flawed allocation system.

1. In assessing any approach Council had to use the principles and considerations of RPS WL 5B. This is the statutory test. Using this test identifies that allocating on the basis of land use activities via grandparenting/sector averaging comprehensively fails.

|  |  |
| --- | --- |
| **RPS Policy WL 5B** principles and considerations | **sector average allocation** |
| (a) Equity/Fairness, including intergenerational equity; | **X** |
| (b) Extent of the immediate impact; | 🗸 |
| (c) Public and private benefits and costs; | **X** |
| (d) Iwi land ownership and its status including any Crown obligation; | **X** |
| (e) Cultural values; | **X** |
| (f) Resource use efficiency; | **X** |
| (g) Existing land use; | 🗸 |
| (h) Existing on farm capital investment; and | 🗸 |
| (i) Ease of transfer of the allocation. | **X** |
|  | **3/9** |

1. The Plan Change 10 process did not constrain its assessment of various policy choices to RPS policy WL 5B criteria. Instead it introduced a series of four more parameters developed by the Lake Rotorua Primary Producers Collective, a sub-group of StAG. This had the effect of reweighting WL 5B(h) to count for 3, not one. It also reinterpreted “intergenerational equity” as meaning future generations should not bear the costs of no or insufficient action now. A possibly more valid interpretation of intergenerational equity would be that future generations’ land use choices should not be constrained to land use choices of today.
2. The assessment of appropriateness of policy choices for Plan Change 10 included a table assessing various options (S42A para 134). CNIIHL believe conclusions reached that rules out various policy options are not accurate, reasonable, and are not supported by evidence. The table also weights the Integrated Framework**[[20]](#footnote-20)** - including the LRPPC extra criteria the same as the RPS, which is not appropriate.
3. One option considered was to add an objective and policy *providing for flexibility of Māori owned land or Forestry*, the latter of which has a very low emission profile and under a grandparenting allocation regime is constrained to that use alone. The report noted that it would “*provide a policy that with a focus on a person/s, rather than a land use activity as required by the RMA*”. It is hard to follow this argument as forestry IS a land use activity, no different from dairy being a land use activity. Council’s rationale for dismissing this option is therefore not valid. The existing policy provides for other land use activity to have flexibility, but overall flexibility in the catchment is lost because Council has used an allocation regime that locks land use into historic land use. Putting this option into effect would require reallocation of load, and the quantum of reallocation would likely make the dairy allocation unsuitable for dairy to continue. But that is not sufficient reason to rule it out if the nett benefit of the option is greater.
4. Council also considered a restricted discretionary activity status allowing plantation forestry to develop in accordance with land use capability. The report notes how that would change the allocation profile:

*This policy results in the need for reallocation of nitrogen, as any rule that allowed for plantation forestry to develop in accordance with land use capability would require an equal nitrogen reduction within the catchment. As there is 2943ha of plantation forest on LUC class 1-4 land within the PC10 boundaries, providing for this to convert to the lower nitrogen discharge allowance range boundary for dairy or upper range boundary for drystock (54.6 kgN/ha/yr) it would equate to 153 tonnes of nitrogen, which is greater than the 140tN/yr on farm reduction required by the rules. Alternatively providing an allocation to the NDA average for drystock (25.6kgN/ha/yr) for the 2943ha would equate to 68 tonnes of nitrogen or 49% of the current target for on farm reductions under the rules*.

but it does not explain why this is not a viable option, it just leaves hanging what the effect of the present regime has done in allocating to those whose land use in the last 25 or so years has been to have high nitrogen emissions. It clearly highlights the winners and losers of the proposed policy.

1. A further option considered and ruled out was reallocation of nitrogen to forestry. Council advises that allocating more nitrogen to forestry will result in reduced allocations to either the Dairy or Drystock sector. *This will alter the Integrated Framework* *was developed based on “extensive community engagement”.* Although Council chooses to believe that this Integrated Framework was developed based on “extensive community engagement”, CNIIHL contends that the Integrated Framework, developed by a sub-group of StAG shows strong evidence of governance capture. It was not developed by impartial observers with nothing to gain. It was developed by the same select group that benefit most from it. The present nitrogen distribution hugely weights towards current land use, not appropriate land use. Council advises that re-weighting N would result in increased economic impacts “within the sector”. Council must already be aware that their policy construct have multi-million dollar negative economic impacts on groups they have chosen to ignore. Noting that this will change the economic impacts is not a compelling argument for not doing it.
2. Putting this into a RMA s.5 context, the Proposed Plan Change enables the pastoral farming community to provide for their economic and social well-being, but there is no capacity for other land users to do so. The combined effect of the objectives, policies and rules and methods are that land used for pastoral agriculture, which has been identified as the most significant source of nitrogen leaching, is provided with an allocation of nitrogen at the same levels per hectare as over the period 2001 to 2004, from which to start a reduction process. Farm land will lose the cost-free opportunity to intensify production if that involves increased nitrogen leaching, but that land has been gifted up to $400/kgN. I.e. RPS WL 5B (a) to (c) are completely ignored. Those land users who have been unable to change land use, lose the opportunity to do so, **and** are required to contribute through rates and taxes to the compensation to be paid to retire N out of the system, and to upgrade sewerage systems. I.e. substantial tangible economic benefits are provided to high-leaching land uses and costs and constraints are imposed on low leaching land.
3. The Plan Change 10 regime sets up a situation whereby the owner of a non-polluting site must pay the owner of a polluting site to carry out an activity that the polluter can carry out as of right at no cost. The cost differential that this plan change sets up is to put CNIIHL at a severe cost disadvantage compared to the potential land use capability of its estate. The first number is in the ballpark of what the incentives fund is buying N out at. The second is what the plan talks about as an expectation of trading price.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| LUC class | **Ha** | **av allocation** | **Attenuation**  **%** | **N buyout $** | **$ value** |
| 3 | 273.8 | 64.5 | 0.48 | 350 | 2966897 |
| 4 | 332.4 | 64.5 | 0.48 | 350 | 3601886 |
| 6 | 1917.6 | 25.6 | 0.48 | 350 | 8247214 |
|  |  |  |  |  | **14,815,997** |
|  |  |  |  | **N trade $** |  |
| 3 | 273.8 | 64.5 | 0.48 | 200 | 1695370 |
| 4 | 332.4 | 64.5 | 0.48 | 200 | 2058221 |
| 6 | 1917.6 | 25.6 | 0.48 | 200 | 4712694 |
|  |  |  |  |  | **8,466,284** |

1. There is a clear relationship between the amount of nitrogen being leached into the catchment and the quality of water in Lake Rotorua. Natural nitrogen inputs that cannot be reduced include the amount falling directly on the water and that from land covered in scrub or forest, including plantation forestry. Other land uses contribute higher amounts of nitrogen. The largest total contribution comes from dairy farming. The greatest intensity of contribution comes from dairy farming, which has increased in both area Figure 2, and intensity between 1996 and now.
2. This Plan Change sets up a circumstance that allows those activities which create high levels of pollution to continue. They can choose to be rewarded by continuing to pollute, or they can choose to have those pollution credits bought out through public purchase of the right to create the adverse effect (buying N units). At the same time the Plan Change deprives land users who have not contributed to the adverse effects the right to alter their land use, except by purchasing rights off the activities creating the adverse effect. And they can only do so after a moratorium of five years. Providing for the social and economic well-being of one (polluting) section of the community at the expense of another (non-polluting) section is not consistent with achieving the purpose of the Act. It is not sustainable management of natural and physical resources. This is not equitable or fair. Nor is it efficient land use.

# **Modelling**

1. The third part of CNIIHLs evidence considers the role of modelling in the policy framework. This is because setting and implementing the policy for this Plan Change relies profoundly on modelling. Allocation has been chosen as the primary method to reach a specified cap on inputs to the lake. Our contention is that the quality of modelling available voids the allocation regime choice argument, because the modelling cannot provide sufficient certainty about the outcome (Tonnes to the lake) nor can it accurately or precisely ascribe components of that output to specific land uses.
2. Overseer is the key model for determining nitrogen outputs per farm, which is required for the allocation process to work. Its results are also an important input into ROTAN[[21]](#footnote-21), which endeavours to represent the time-series of nitrogen inputs to the lake i.e. the veracity of Overseer is crucial to the working of Plan Change 10 both for identifying the target quantity for the lake to reach a TLI of 4.2, and for identifying the individual site inputs that form that total. This evidence assesses how well Overseer performs as a conceptual model to represent the nitrogen pollution processes in the Lake Rotorua catchment.

**Modelling Principles**

1. Modelling is a substitute for direct measurement. A model is an abstraction of an aspect of the real world and there will always be ways that it varies from the real world. Understanding where and how significant those variabilities are is crucial, so they can be accounted for in any decision-making that relies on the modelling. If this does not happen, those relying on a model are at risk of using it in a way that exceeds its capacity to precisely or accurately reflect a circumstance. For example a model that represents an outcome with an accuracy[[22]](#footnote-22) of +/- 30% (due to the ability of the model to represent N transport through plant, soil and ground) and a precision of +/- 30% (due to interpretation differences of input data by those using the model) should not then be described with a precision of sub-decimal place – such as 17.5kgN/Ha. To do so gives false confidence in the model’s ability to ascribe a value.
2. In most cases modelling starts with a conceptual model which is used to represent physical processes in a [logical](https://en.wikipedia.org/wiki/Logic) and [objective](https://en.wikipedia.org/wiki/Objectivity_(philosophy)) way. The modeller’s skill is to minimise the distortions inherent in translating real world circumstances into a mathematical framework which is then represented in software language and run on a computer. This process makes complete and true representation of a natural system extremely difficult. Scientific debate about the merits of particular models for a given task, coupled with debate to clarify the specific weaknesses of models, allows users to determine which results will require caution in their use. In the case of Overseer there has been very little such scrutiny or debate because the schema is not in the public domain. However the owners of the model have extensively cautioned councils against using it in the way it is proposed to be used in this plan.
3. A number of interrelated factors contribute to the design and implementation of a functional conceptual model**[[23]](#footnote-23)**. These are relevant to the use of the model Overseer and how it is being applied to Lake Rotorua:
4. [**Structure**](https://en.wikipedia.org/wiki/Structure)**.** For Lake Rotorua this is the stocks and flows of N into a farming system and outputs through the soil and groundwater. In general a model structure includes the recognition, observation, nature, and stability of patterns and relationships of entities to which the model refers.
5. A [**System**](https://en.wikipedia.org/wiki/System) is the set of interacting or interdependent entities that form the integrated whole. The model will represent a system as either discrete, where the variables change instantaneously at separate points in time (Overseer), or continuous in which the state variables change continuously with respect to time.
6. Modelling is the process of creating the conceptual representation of the phenomenon to be studied. Model structure will compromise between efficiency and effectiveness in describing the system i.e. its breadth or depth. Other model structure considerations are: [statistical](https://en.wikipedia.org/wiki/Statistical_model) or [deterministic;](https://en.wikipedia.org/wiki/Deterministic_system) discrete or continuous time; what content it must represent; who will use it; how it will describe the system; and what its focus of observation is. Its language should match its purpose. If this information is not in the public domain, those using the model cannot make an assessment of the model’s validity in making a reasonably accurate representation.
7. Its complexity should coincide with the background and experience of those who will use it, if not, the system or its key concepts could be misrepresented or misunderstood, leading to misuse. In the case of Overseer the system design concepts are opaque, so those using it cannot assess its design principles. Those using it in this plan appear not to understand that it cannot precisely represent N loss as a single number, but must do so in the concept of a range. This has led to its misuse as a tool to allocate nitrogen.

Creating a model requires [abstraction](https://en.wikipedia.org/wiki/Abstraction) and assumptions. Assumptions specify the model’s legitimate domain of application. Model users need to understand the assumptions made, and how these affect a model’s validity for a given use.If these assumptions are not in the public domain, those assessing or using it cannot appraise the model’s validity, or quality of its outputs.

1. The conceptual model’s function is to provide a rational and factual basis for assessment of the appropriateness of its simulation application. It is therefore **evaluated** primarily by its consistency to empirical data. Any model that does not match reproducible observations must be modified or rejected. Such modification may be to restrict its operational domain. E.g. in the case of Overseer, this could result in it being restricted in use to the soils for which there is lysimetric (empirical) data – which appears to be only the case for some silt loams. No such data fit has been done for the super-free-draining volcanic soils found around Lake Rotorua. However a fit to empirical data alone is not sufficient for a model to be accepted as valid. Model evaluation also considers:
   1. Ability to explain past observations - history matching - and ability to predict future observations
   2. Cost of use, especially in combination with other models
   3. Refutability, enabling estimation of the degree of confidence in the model (Overseer between-version changes are substantial).
2. After construction, models are **validated** to ensure that the results are acceptably accurate or realistic. Validation can be done by testing the model with multiple sets of data that are independent of the actual system being studied, to check whether inputs have caused a faulty model to output correct results. This is also known as stress testing. Validation can be done by comparing the model's output with data collected from field observations. Researchers frequently specify beforehand how much of a disparity they are willing to accept between parameters output by a model and those computed from field data. No information on how Overseer reacts to various stress tests and the owners of Overseer will not permit stress tests to be done.
3. A [**Simulation**](https://en.wikipedia.org/wiki/Simulation)is the implementation of a model. A simulation shows how a particular object or phenomenon is expected to behave. Where real-world systems or concepts are represented by models, simulation is used for testing and analysis.
4. A model’s capability should also be assessed for these factors:

**Auditable**: Does the framework allow for documentation and tracing of the assemblage of models and data and how they have been used in an application (i.e., provenance). Overseer is opaque.

**Open**: Is the framework open for use and or open-source, and does it use common and open standards for model interfaces and environmental data. Overseer is opaque.

**Powerful**: Complex computationally-intensive models operating at a range of scales can be run, and these can be used in a sophisticated way such as with system calibration and uncertainty analysis. Overseer is opaque.

**Stable**: The framework is likely to be continued, is well-supported and robust.

**Supported**: The framework is well-documented, training and user support are available, and bugs are fixed. Overseer is opaque regarding bug fixes.

**Usable**: There are features to allow for easy set up and run compositions of models, set up and run scenarios, generate a user interface, and visualise model results. No clear interoperability.

1. Building and disputing models is fundamental to scientific rigour. However, if the modelling algorithms, assumptions and methodology are concealed by registration or trademark®, this necessary level of scrutiny cannot occur. This lack of transparency, auditability, validation or verification makes the Overseer model an inappropriate choice for public policy.
2. We have been told that DairyNZ supports the use of the nutrient management system Overseer as a tool *to help* analyse nitrogen and phosphorus loss into water. “*DairyNZ acknowledges that improvements are needed to its accuracy, and to incorporate variables such as soil type, but insists that it is currently the best available model*[[24]](#footnote-24)[[25]](#footnote-25)”. With all due respect to Dairy NZ’s position that this is the best available option, CNIIHL’s concern is that this model is just not of an appropriate design, nor able to produce accurate enough results to be used as a deterministic tool for allocation, particularly where that allocation has multi-million dollar implications for land owners.
3. CNIIHL firmly believes that Overseer is not fit for the purpose of N allocation. Its original design (comparative rather than absolute) makes it not fit for purpose. Its trade-marked ownership by the agricultural sector makes in inappropriate to be used in trade-offs between agriculture and other land uses, as no one outside this sector can audit it. This commercially-founded opacity provides little reason for faith that it has avoided capture by the industry it is supposed to be assessing. The opacity of its design and workings makes it unfit for use in the public sphere for contestable funds. Or for making allocation decisions that will swing land values by millions of dollars. Those using it do not appear to understand that it cannot generate precise, accurate and absolute numbers. Overseer may have avoided a Garbage In, Garbage Out (GIGO) problem, but those using it appear to have jumped to a conclusion that a requirement for precise inputs will necessarily mean the model can produce accurate outputs. If the model has poorly designed algorithms, loose assumptions or significant uncertainty, outputs will still be unreliable. There are known within-model issues. However the number range of any numbers Overseer generates do not display the confidence interval. There are known operator issues. This means that data entered by different people will produce different results. I.e. use of the model lacks repeatability. Issues arise from lack of accurate records on farm, especially proof of placement of NPKS to management blocks, stock weights, movements and interchanges between management blocks over time. These data on feeds, fertilisers, stock movements and block management are required. If they are poor they will lead to interpretation error by the specialist professional. Input error may be as high as 30%.
4. The Overseer website clearly acknowledges uncertainty[[26]](#footnote-26)

*Models like Overseer must involve simplifications of complex processes and the predictions will always involve uncertainties. There are only limited test data; these do not cover all combinations of soils, climate and regional variation. Uncertainty will increase significantly as a situation moves from the information used to develop, calibrate and validate a model. Uncertainty can be decreased by obtaining more data for calibration and validation; for different soil-types, climatic environments and [farming] enterprises.*  The Overseer owners also identify that as *Overseer is an important tool* ***to help support*** *farmers, industry and policymakers to increase land productivity while improving water quality, the owners are* ***In the longer term****, working to continue to decrease the uncertainty around estimates through improvements in the underlying science*.

1. We are none the wiser about the **level** of uncertainty though. Or which aspects of uncertainty stress the model the most. While Dairy NZ is convinced it is the best available, it has some very serious limitations, a number of which can only be guessed it, because of the reluctance of its owners to expose it to proper scientific scrutiny. A recent study of a range of models used in freshwater[[27]](#footnote-27) identified that Overseer had these technical characteristics:

* Delphi Language, MS Windows OS
* **Unknown** whether a formal application programming interface (API) is defined
* **Unknown** whether the model engine separated from the user interface – but thought to be.
* **Unknown** methods included for calibration and uncertainty (whether they exist, or what they are)
* “**Significant improvements**” in version 6 Quality of code and systems engineering – but no information from what base a “significant” improvement might mean.
* **Sparse availability of documentation of theory and code/software** - but “improving”!

1. CNIIHL reiterates that it is inappropriate to use a conceptual model for high-stakes policy implementation when that model’s inner workings are opaque, poorly understood, possibly poorly characterised, and the owners of the model will not reveal where uncertainties in performance exist.
2. It is inappropriate to use Overseer as though it were competent to provide absolute, precise and accurate numbers. If the hearing commissioners need further evidence of just how inappropriate this is, a comparison of Overseer to a different model working in a similar context highlights the responsible use of a model. This shows how its processes and the likely confidence of any output from it is explained. How it represents uncertainty is quite enlightening for those believing that the single-output from Overseer is valid.
3. The model used in **Guidelines for separation distances based on virus transport between on-site domestic wastewater systems and wells ESR Client Report No. CSC1001** is one where all the assumptions and limitations are clearly spelled out. This model lists the types of aquifers and associated (ten) vadose zone materials for which the Guidelines provide separation distances. The saturated zone is also characterised into six types. The model explains how it dealt with flow:

*Two models were run in parallel for these calculations: the first described matrix flow and the second, the flow through macropores*.

1. It explains which modelling software it uses, and the limitations that it has to deal with:

*Groundwater flow and virus transport were modelled using MODFLOW[[28]](#footnote-28) and MT3D[[29]](#footnote-29) software packages, respectively. These modelling packages require hydraulic properties (hydraulic conductivity and porosity) of the aquifer materials and removal rates, amongst other things, as inputs. The heterogeneous nature of most aquifer systems means that their hydraulic properties vary randomly throughout the aquifer, and cannot be analytically calculated. Instead, stochastic (probabilistic) approaches have to be used for modelling.*

*The concepts and the modelling detail are discussed in Section A6 in Part 3.*

*The factors affecting sensitivity are discussed in more detail in Section A1.3.*

*This project contains many modelling components. Some of the components have been verified with field measurements, e.g. the component addressing virus indicator transport through alluvial gravel aquifers. However, many other components simply represent our estimate on the basis of the best available data.*

*Limitations in the guidelines arise from two sources:*

* *technical - resulting from the assumptions that have to be made to make the modelling problem tractable (as discussed in Section 5.8)*
* *non-technical – the work is outside the scope of the project.*

*Verification of the guidelines has not been possible. Ideally, the accuracy of the predictions of a model should be verified by empirical testing via aquifer sampling.*

1. It explains the details of the modelling approach used to develop the guideline values, with the aims of:

* allowing the approach taken to be assessed, thereby supporting the scientific defensibility of the guideline information
* providing information that will allow this work to be extended when more data become available, thereby broadening the applicability of the guidelines and increasing their robustness.

1. It identifies the uncertainty, the responses to uncertainty, the concepts and soil mechanisms, the assumptions, the information references, the confidence intervals:

* *Uncertainty is an intrinsic feature of the modelling for this work. Monte Carlo techniques were used to take account of the uncertainty. The Monte Carlo approach allows the separation distances between the disposal field and well to be provided with a 95% level of confidence.*
* *Three major components determine the removal viruses in sewage: processes in the septic/tank disposal system (including transport through soil), transport through the vadose zone, and transport through the saturated zone.*
* *At shallow depths, transport through the saturated zone is the most important, but as the groundwater depth increases, the characteristics of the vadose zone become more important.*
* *The modelling results are most sensitive to the removal rates. Transport processes play a less significant role in determining the calculated virus removal.*
* *Very few data for the removal of viruses in New Zealand soils are available.*
* *The log10/m reductions for New Zealand soils used in the modelling were obtained from two New Zealand studies (Pang et al., (2008); McLeod et al., 2008)). These papers measured removal of bacteriophage.*
* *Using the data from these studies, it was possible to assign to a range of soils (described using the New Zealand Soil Classification) a log10/m reduction value. The soils were assigned to one of three* *generic groups according to their estimated ability to remove viruses. The groups were based on the microbial bypass flow rating assigned to each soil order by McLeod et al.*
* *The log10 reduction achieved in the soil at a site is determined by multiplying the soil thickness by the assigned generic log10/m for the soil.*

1. It may seem paradoxical to trust a model that exposes its weaknesses. However since it is inherent in all models that there will be weaknesses, a large component of trusting a model to be able to see that model designers are fully aware of its limitations. Being fully aware of the model’s limitations means that any use of the model is less likely to overstep its zone of competence.

1. By contrast flaws in Overseer are generally dealt with secretively, and sometimes only in a circumstances where it performs in an unexpected way, delivering significant anomalies (E.g. between version 6.2 and 6.3, how it dealt with N residence time in the root zone). This has significantly reduced the trust in the model/its owners to accurately represent its limitations. A major factor that appears to discourage the owners of the Overseer model from exposing it to proper scrutiny is an expectation that it has significant monetary value as a trademarked tool, and that to reveal its inner workings would allow competitors to create alternative models. This has encouraged behaviour on the part of the model owners that is contrary to sound scientific method and that will undermine its value.

**Known flaws in Overseer relevant to nitrogen transport**

1. Although the workings of Overseer are opaque, it is still possible to discern flaws because of the way it behaves. An immediate concern is that any model that is describing processes in the natural world should be representing the result as a number within a confidence interval. Overseer results are usually represented as one number, not as a range. It can’t have that level of accuracy. This is a model that is attempting to model nitrate transport through the soil and vadose zone, for which there will also be preferential pathways, for any climate or soil in New Zealand. It has only been validated (predictions measured against real-world soil testing) for a few soils, but is nonetheless being used on all soil types. The hydrogeological settings for the vadose zone from the ESR report referred to earlier in this evidence are:

|  |  |
| --- | --- |
| **Input parameter values used for vadose zone modelling** (page 229) | |
| **Hydrogeological setting** | **ranges** |
| infiltration rate | 0.01 to 0.05 |
| macropore contribution to total flow | 0% to 50%, |
| transport porosity **Θ** matrix flow. | 0.01 to 0.65 |
| transport porosity **Θ** macropore flow | 0.0025 to 0.05 |
| removal rate loge/m matrix flow | 9.2 x10-4 to 9.2 |
| removal rate loge/m macropore flow | 9.2 x10-4 to1.7 |

1. These ranges make it clear that for credibility Overseer must represent outputs as ranges. It is known that it can’t model preferential pathways – be they macropores, structural subsoil features or even those as simple and obvious as mole drains, all of which will affect nitrate’s ability to elude the roots of the plants and travel through groundwater directly into the waterway. This is a very significant source of error.
2. Overseer has not been validated to the characteristics of different soil types. Our understanding is that the Overseer model has only been properly validated using lysimeters on a silt loam soil family, on a farmlet at Lincoln. This means its accuracy for the soils of Lake Rotorua is unknown, as the soils Overseer is validated for are barely present anywhere in the catchment and the climatic circumstances it has been tested in are not the same.
3. It assumes best management practice: *“OVERSEER assumes some specific GMPs are used because not all processes can be adequately captured by a model, poor management is difficult to quantify, and a model like OVERSEER is not necessarily the best option to capture poor management practices. In general, if GMPs are not followed, environmental losses are higher[[30]](#footnote-30).*  It can’t represent physical mitigations. Which severely limits its value for assessing N output reduction techniques. A table of assumptions Overseer is known to makes versus how often those are in place on a normal farm is at Annex B. In short the absence of these pre-conditions on many farms just adds to the confidence interval that needs to be applied to any Overseer file output.
4. The preceding discussion identified some of the known limitations that apply to the most recent Overseer version. However modifications to the way the model has been used in the Lake Rotorua catchment seriously compounds these problems that are innate to the model design.

**Overseer “reference files” – creating additional flaws**

1. In developing the allocation limits and farmer performance requirements for the Lake Rotorua plan, the Council initially used version 5.4 of Overseer. Overseer versions change relatively frequently to reflect improved understanding of the systems it endeavours to model. Those versions usually re-characterise the quantum of nitrate leaching. This change in accuracy of algorithms in itself is a clear indication that Overseer outputs should not be used to characterise absolute numbers. Having set the initial performance requirements for the plan policy using the 5.4 version Council needed to take account of the most recent versions, so they decided to cross reference the outcomes of version 5.4 to version 6.2.0. In order to do that they created what they called “reference files”. They did this by:

“…*Establishing one dairy reference file and one dry stock reference file that* ***approximately*** *represent the average per ha discharge of the range in N losses associated with each sector, as determined by the dual range allocation method*.”

1. The wide range of farm systems each have different base resources, and then they use varying amounts of differing types of inputs. Matheson’s evidence says that he has averaged these to form one farm system, thus creating a crude protein profile/ nitrogen use pattern and platform - which may be quite different from the actual farms the specific data was relevant to. I.e. to create “a reference file” severely distorts reality - to the point of nonsense because the averaging process lumps together farms whose resource use has been efficient/well implemented with farms where resource use has been inefficient (profligate). These very different N leaching platforms are now synthetically merged into one “representative” platform.

*“Re‐running the reference files when new versions of OVERSEER are released and calculating the* ***percentage shift*** *from the previous reference file N loss”*

*“They should also aim to be simple files that don’t rely on the less well understood and complex functionality within OVERSEER.”*

1. Assumptions are being made that magnify the errors. Overseer differentially treats various sources of N. None of the reductions in N leaching are a linear relationship. They depend on what the N source is and the Overseer treatment of varying these levels, or the application rates and times for Nitrogen. This assumes linearity, however the changes to N leach vs. “profit” are not linear. This mis-interpretation serves to reduce the penalties for those who are presently contributing a greater pollution load and exacerbate the penalties for efficient farms.
2. The impact of N on N leaching in Overseer also appear to vary [insofar as it is possible to back-cast Overseer reactions to various inputs] as total application reduces below 50 kgN/ha. I.e. it appears that this is not a linear relationship. The various “inputs” of N do not show a linear decrease, because there are differing levels of N in the feeds used. Averaged data cannot identify which feed is being used, the crude protein of each of those feeds, how much N was used, or the response to that N. However, the reference file exercise means all the feed is now synthesised into mock data to match a perception of a “typical” farm system that is not a “typical” farm system because:

*“..Replicating the reference file farm systems on individual properties is unlikely to deliver the same assessed N losses”*

*“The obvious solution to this would be to create a reference file that incorporated or utilised all possible farm system components and stock types. However, in the author’s opinion this would undoubtedly create a nonsensical and unfeasible system. We consider ensuring that the reference files reflected a possible feasible reality a better compromise than the former approach.*

1. The synthetic dataset is all averaged. So how can these important input distinctions be differentiated? The referencing methodology ends up with a hypothetical farm that represents no farm, which is blind to the actual mix of resources that created the dataset that this hypothetical farm was manufactured from:

*5.1.4 It is also important to remember that that reference files represent “average” Rotorua farm in a geophysical sense. Replicating the reference file farm systems on individual properties is unlikely to deliver the same assessed N losses and care needs to be taken not to represent the models in this way.*

1. In any scientific method, it should be possible to achieve the same answers for the original farm systems, as they contributed to the data set. This becomes proof that the data and method used is correct. By contrast the reference file “methodology” relies totally on linear relationships, yet these only occur over very short areas of what are otherwise curvilinear response curves and relationships. This indicates that the person designing it understands little about diminishing returns, or the importance of marginal change.

*5.2.1 The stocking rate table concept attempts to take an extremely complex N loss calculation methodology and simplify it to a single table that is designed to be used by a wide range of land owners. We fully recognise that most farm systems typically have differing numbers of a given livestock class over a calendar year. Animal feed intake and N leaching also have seasonal variation within the Overseer model.”*

1. In short an opaque, industry-owned model, originally designed to be comparative, is being used as an absolute model, with further bolt-on modifications that are totally at odds with its fundamental design, to allocate millions of dollars, and make millions of dollars of change to land use values.   
   But it gets worse:

*Appendix 5*

*5.5 With benchmark data anchoring the sector range allocation framework, the impact of not addressing this* ***residual “error****” in the relativity between reference and benchmark N losses could, depending on the nature of a given science change or modelling bug, potentially result in either:*

* *the temporary erosion of N reduction targets or*
* *the temporary erosion of a farmer’s NDA. Neither outcome is likely to be desirable in the interests of water quality, equity and certainty for farmers.*

*3.11 All of the initial files generated N losses in excess of the sector average N losses supplied by the BOPRC when modelled in “OVERSEER”. This is due to the greater levels of pasture consumption, stocking rate and therefore urine deposition than the average benchmark data implied occurred on farm between 2001-2004.* [I.e. intensification has occurred since the benchmark period?] *On this basis it was determined that the potential pasture growth rates used, which had been interpolated* [actually they had been extrapolated] *from recent actual performance of farm systems within the catchment, were* ***not representative*** *of pasture growth potential in 2001-2004*.

*“the dairy reference file was created to* ***more or less reflect*** *the farm system components and performance levels supplied by the BOPRC (i.e. higher stocking rates, lower per cow performance), rather than exactly replicate them.*

*4.1.3 - In comparison to the previous reference file, the cows were all modelled with a later calving date, lower genetic merit and a more spread out calving pattern -all of which, in our view, reflect typical farm practice/achievement in the 2001-2004 period. These are the primary factors that lead to the lower per cow production and lower overall milk production in the recreated reference file farm system, despite significantly higher feed and nitrogen inputs.* [The main difference in the last few years had been stocking rate and supplements, not genetic or production merit (BI/PI) or calving dates and patterns. Those were features of the 80s and 90s.]

*It would have been preferable to have been able to utilise validated pasture growth curves ~~interpolated~~ extrapolated from actual individual farm data from the 2001-2004 period as the basis for the Farmax modelling rather than modifying the current pasture growth data* [making stuff up?]. *However, given actual stocking rate data was provided, it is clear that pasture consumption was, on average, lower than we might expect from current pasture growth data.*

1. Council used modelling to back-cast to 2004, to pull previously unengaged farms enterprises into the benchmarking exercise, using “Overseer”. This attempt to define a “normal” farm and pasture harvest and stocking rate, and correlate between different versions of Overseer required that important elements of Overseer were ignored. The end result is that although the per property numbers might now fit the overall profile required for an allocation policy, their relationship to actual land use performance in the Rule 11 benchmark period is hazy at best. Further, attempting to obtain meaningful correlations from version to version of Overseer has required significant manipulation of the data. Manipulating data in a model for which the workings are deliberately obscure, and ignoring significant error ranges, when millions of dollars are at stake, is irresponsible.

**Overseer is not competent to be used with regulatory effect**

1. BOPRC assessed the appropriateness of using Overseer with regulatory effect in the Rotorua catchment[[31]](#footnote-31). The reasons given for recommending that Overseer is fit for the purpose of regulating nitrogen loss from farms are not compelling. They include:

*(i) Overseer provides* ***an estimate*** *of long-term quasi-equilibrium nutrient loss, consistent with the long-term catchment nutrient load objectives applicable to Lake Rotorua and other catchments.*

*(ii) Overseer incorporates the best available science on nutrient loss in New Zealand, and is* ***regularly updated*** *to reflect new science.*

*(iii) The Overseer owners have established a governance and research framework that gives confidence to regulators that the model will continue to endure and* ***improve****. This framework includes the development of supportive institution-based programmes, notably:*

*x The Code of Practice for Nutrient Management (2007)*

*x The Fertmark and Spreadmark quality assurance schemes*

*x Overseer Best Practice Data Input Standards (2013).*

*x Industry training through the Massey University intermediate and advanced certificates in sustainable nutrient management*

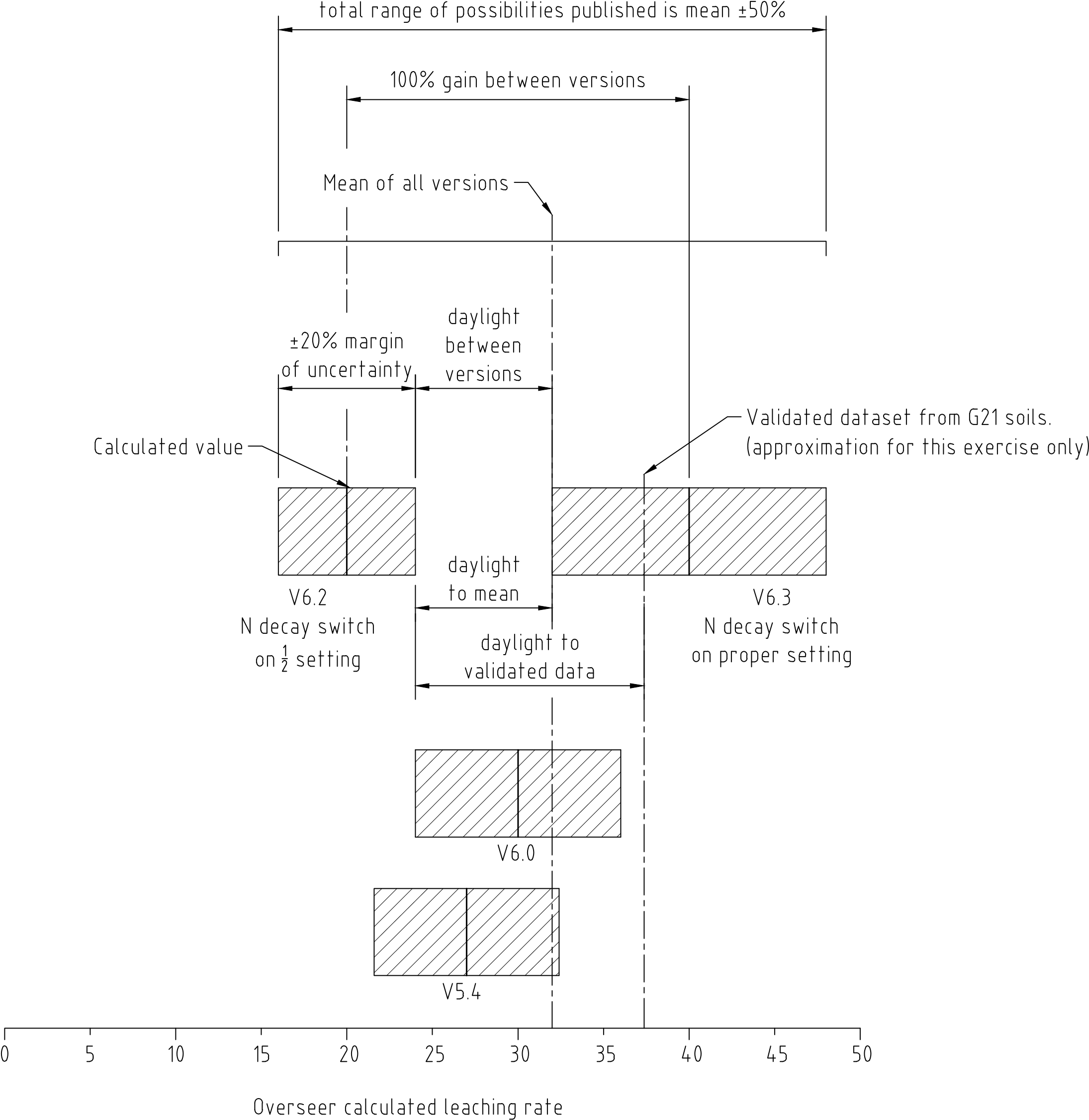
*x The Nutrient Management Adviser Certification Programme for quality assurance and professional development purposes.*

*(iv) Most regional councils have adopted Overseer as a key regulatory tool to manage N loss,* ***albeit in varying ways***[none of which seek absolute numbers in the way that Plan Change 10 does]

*(v) Regulatory usage of Overseer has been endorsed by the Environment Court in deciding appeals on Waikato Regional Council’s Taupo variation (RPV5) and in Horizon’s Proposed One Plan (POP), with the key POP Overseer provisions also being endorsed in the subsequent High Court appeal.*

1. All of these reasons serve to confirm that Overseer is a work in progress that is incapable of accurately and precisely representing N loss. And none of these reasons cut to the heart of the problem. Overseer outputs cannot provide regulatory certainty on numbers of kilograms of nitrogen loss. It’s clear that Overseer can only ever provide an estimate of output. The confidence interval or the standard deviation of this output is never expressed. We have no information on the confidence interval or the standard deviation[[32]](#footnote-32) on any figure that Overseer produces. A scientist involved early in the development of the model characterises this as at least 30% “*but it can be up to 100 percent if you get some of the input data wrong*” [[33]](#footnote-33). We have been advised that different people using the Overseer model on the same farm, using the same questions to the farmer, will come up with different outputs. i.e. The number that Overseer will produce will have an unknown confidence interval. It requires statistical skill beyond what we have available to represent the total confidence interval of using Overseer when a 30% variation of a model output figure is compounded by a user variation of up to 100%.
2. The output estimate changes with each version change, see Figure 3. We have added a confidence interval to give an indication of the range of outputs possible within versions, considering such factors as ranges due to soil and vadose zone differences. There are then the between-versions variations. This does not include within-version user variance.

### Figure 3 variance between versions of Overseer assessed N leaching rates



flawed

corrected

1. Contrary to Mr Park’s assertions, these changes are not always due to changes in science. They are often due to changes in algorithms. Arguments that other councils have used Overseer (in various settings, but not to the level of precision attempted here) are irrelevant. Arguments on governance and use, such as that “model owners are committed to continuous improvement and training”, or that “they reference it to codes of practice”, are irrelevant. Those observations do not seek to understand the heart of the model, and how it represents the world, and what limitations it has in doing so. It is a model, and all the numbers it produces are means within a range.
2. Mr Park confirms his view that Overseer is appropriate with this statement:

*“Notwithstanding the clear rationale above for using Overseer to regulate farm N loss”…*

The “clear rationale” is wholly unconvincing, for reasons discussed above on model structure, model purpose and model competence. He continues with:

“*there are significant corollary arguments and limitations to consider, including*:

*(vi) The rules and their implementation must deal effectively and fairly with changing Overseer outputs arising from version updates, and model uncertainty, as per Recommendations 1-7 in this report.*

1. Our evidence shows that attempting deal *effectively and fairly with changing Overseer outputs* is a fool’s errand. There is no way to translate from one version to another, particularly not via a construct “the reference file”. The relationships are not linear. Mr Park continues his justification with:

*(vii) Overseer-based rules need to be supported by other methods, notably farm nutrient management plans and one-to-one interaction between farmers and Council staff. In fact, it is apparent that several regional plans have adopted farm nutrient management plans as the primary regulatory tool with such plans supported by Overseer nutrient budgets.*  i.e. other regional plans use input measurement and Overseer is relegated a decision support tool, which is a role it is competent to perform.

*(viii) Predictions of P loss within Overseer are less certain than N loss predictions and subject to more variable off-farm attenuation i.e. at this stage it is not recommended to use Overseer to regulate P loss from farms.*

*(ix) Other nutrient models may prove satisfactory for regulating N loss and other regional plans have made provision for this. This “multiple model” approach was also a factor in the High Court’s finding that the POP’s referencing of Overseer did not need to specify a single version.*  This contradicts all the statements above about the certainty that can be ascribed to Overseer outputs.

*(x) Despite the incorporation of Overseer into several regional plan rules intended to limit nutrient loss, there has not been any publicised enforcement action based on those rules – or at least no cases before the Environment Court. The lack of enforcement case law means that BOPRC and other regional councils cannot be sure how non-compliance with N limits will be handled, including the challenges around Overseer versions and uncertainty.* This speaks for itself.

*(xi) The compliance practices developed by the Waikato Regional Council for the Lake Taupo catchment provide some useful guidance, including:*

*x Focus on compliance with the farm nutrient plan provisions, especially the key management factors that drive N loss such as stocking rate, stock mix, wintering practices, fertiliser and feed usage etc.* In other words, manage via input controls.

*x Encourage good farm record keeping.*

*x Prioritise compliance effort on relative risk i.e. some farms will have larger gaps between current N loss and NDA levels.*

*x A tiered monitoring regime can be based on the landowner’s compliance track record, similar to how several regional councils prioritise dairy shed effluent monitoring e.g frequency of site assessments.*

*x Apply the typical enforcement response hierarchy, relative to the specific circumstances of each non-compliance issue i.e. a range of responses from advice, directive letters, formal warnings, abatement notices, infringement fines and prosecutions.*

*x Maintain effective communication with farmers and their farm advisors.*

1. None of these reasons for caution attempt to assess any of the structural elements: the schema, structure, modelling concepts, modelling language, algorithm constants (e.g. fluid flows through soil and the vadose zone), data sources, calibration, validation, or verification of this model. Because it fails to assess the relevant components, it fails utterly to establish whether this model is fit for purpose. We continue to contend that it is not. CNIIHL are unswayed by arguments that There Is No Alternative. TINA is often the refrain of those who have a vested interest in maintaining the status quo. There is always an alternative, or myriads of alternatives.

# **Plan effectiveness and efficiency assessment against criteria**

1. Our final section asks the same questions as those asked in the Council’s planning evidence.

**Is the Plan based on a robust platform of science?**

1. We contend that the science analysis relies very heavily on the model Overseer to both characterise individual property N emissions, to enable allocation to occur, and as an input to ROTAN model, which has been used to establish the stocks and flows of N into the Lake. This analysis comprehensively overlooks the grave limitations of this model to precisely or accurately model N stocks and flows in any absolute sense. The Overseer model’s original purpose was to make comparative present time assessments, not absolute future assessments. This model is not fit for this policy purpose. It has not be adequately validated or verified and its confidence intervals are completely uncharacterised. The level of faith in the outputs of this model, and its centrality to the policy framework are totally inappropriate. This has led to inappropriate policy choices at macro and micro level.

**Is it a result of credible and reasonable choices between options – both at a macro and micro level?**

1. We contend that Council did not make credible or reasonable choices at the macro level, in either the policy framework they chose or in the process they used to develop that policy framework into rules for the Rotorua lakes.
2. Policy design drives behaviour. Behavioural economics, dedicated to characterising behavioural responses to various policies,[[34]](#footnote-34) would identify what behaviour to expect with various policy choices. Allocation behaviour is severely at odds with the objectives of the plan.
3. Council very early on chose Cap, Allocate and Trade because action to reduce Nitrogen pollution had to drop to reach a set target of 425 Tonnes by 2032. Council argued that because this particular numeric goal must be reached, the only appropriate methodology was to allocate. It appears that little attention was paid to whether there were any tools that could accurately characterise the contributions of various sectors and individuals and how that would affect any meaningful implementation of such a policy. Allocation requires an accurate measure of the portfolio of pollution contributions in order to accurately allocate portions to various parties. If there is no way to provide competent data by measuring or modelling, then policy that uses an allocation approach lacks the tools to implement it. If the only tools provide a partial analysis of the pollution portfolio, the policy must respond to the quality of the data that informs it. Policy that proposes elaborate and detailed allocation regimes cannot work with modelling that can only give gross indications.
4. The model used (Overseer) is incapable of generating credible assessments of nitrogen inputs to the lake on an individual property basis. This meant that much more consideration should have gone into whether the policy could be framed around an allocation regime. The other two main policy options, regulation and polluter pays[[35]](#footnote-35), were discarded with no proper analysis [sec 32 pg 125-126]. By making a macro level policy decision to use allocation, Council has chosen a policy regime for which they do not have the tools to successfully implement it.
5. A policy regime of allocation demonstrably does not drive pollution-reducing behaviour. Allocation drives rivalry, whereby parties compete to acquire the maximum of the available of the common property resource for themselves/ their group. After allocation has occurred it then drives behaviour of “test my performance against my agreed limit”. To carry out such a test requires competent and trusted measurement techniques of the pollution. These techniques don’t exist.
6. Council compounds its poor macro policy choice with a poor process choice for arriving at a workable allocation regime. A policy regime based on allocation triggers rivalry behaviour between those who are going to be competing for resources. Council decided to use a collaborative stakeholder process for allocation policy development. Policy that drives rivalrous behaviour, for a resource worth millions of dollars, was developed by a group of people selected by Council. Some of those selected have millions at stake. Others were really only interested in the ends (a clean lake), and were agnostic about the means (who wins or loses in the allocation roulette). Some have significant national-level resources available to them, and experience in similar processes in other parts of the country. Others have never been involved in anything like this before. It is not clear what steps Council took to identify how the resources available to different parties could skew the outcome, or what steps they took to manage this risk. Without constraints this approach is likely to rapidly sideline some groups. It is contrary to human nature to expect such a process to come up with a fair, balanced and unbiased allocation regime. Expecting collaboration to generate an impartial allocation regime that by its nature will creates massive winners and losers is an extraordinarily poor match of process to policy system choice.
7. Council’s response to widely-raised concerns about the suitability of their modelling and measurement tools has been to advise that they will use adaptive management to correct errors over time. The entire reason for using a cap, allocate and trade approach is because Council requires certainty about limit and contribution to that limit. Without that certainty the few benefits of cap, allocate and trade are overwhelmed by its negative features – namely the counterproductive rivalry and gaming behaviour it drives. This counterproductive behaviour has been most obviously demonstrated in rivalrous collaborative process that played out for developing the Lake Rotorua allocation regime. This first discarding as irrelevant to proceedings a number of land owners, due to the current land use on their land. It then exhibited complete governance capture by allowing the devolution of the micro aspects of the allocation regime to the group creating the most pollution. This appears to have been further devolved by getting significant input from an industry representative from an agency whose member’s activities create the most pollution of all – the dairy sector. No checks or balances were put in place to identify or manage regulatory capture.
8. Council did not seriously look at Polluter Pays. A charge regime does drive behaviour that reduces pollution, causing those doing the polluting to focus on reducing their pollution so as to reduce their costs. And, depending on the fee, they may have considerable incentives to do so. This policy approach was discarded early because the outcome is not certain and Council had a fixed target to reach. In discarding this approach Council neglected to consider both the adaptive management capabilities of Polluter Pays whereby if the fee proves to be too small an incentive, it can be changed, and that the time period over which the change needs to occur gives time to make some adaptations. The fee is to manage an externality, thus going at least part way to internalising costs that have previously been socialised. Much has been made of the cost imposition that the allocation process will have on high-emitting land uses, and how it might make them uneconomic. We contend that if the only way that they remain economic is by transferring the cost of their pollution onto other parties, this is unsustainable, inequitable, unreasonable and unjust. We also note that New Zealand prides itself on avoiding subsidies, and operating a close-to free market system. This means that there will be times that various enterprises become uneconomic. This creative destruction of entities in a market is how the capitalist system works, and how land use choices have worked for the last 100 years or so. Such a system does produce stranded assets from time to time, horses and carts, canals, analogue mobile phones are large scale. Woolsheds on former sheep land are others. For this plan change to lock land use into its current form, purely because that **is** its current form, and has been for perhaps 20 – 80 years runs counter to the normal functioning of markets of any sort in New Zealand.
9. The significant limitations on the accuracy of the Overseer model make it an inappropriate and unreliable platform for making what will be multi-million dollar allocation decisions. Lack of confidence in the model outputs is compounded by scepticism about its algorithms and assumptions, in part because the model owners will not allow independent parties to scrutinise its assumptions or formulae, or to stress test it through scenario testing. CNIIHL believe that a model that is being used for public policy setting must be open source for public scrutiny of its workings. The reluctance of its owners to allow such scrutiny significantly reduces its credibility.
10. The attempts to shore up the model by developing reference files to try to cross-reference between versions changes shows no understanding that this is not a linear relationship and thus does not lend itself to such a correlation process. Such band-aids serve to exacerbate the fundamental unsuitability and incapability of this modelling tool. There is no known tool that will accurately characterise per-property nitrogen pollution contributions to the lake. Thus an allocation regime should not be the chosen policy option.

**How well are the series of compromises to reach a workable solution elucidated?**

1. There is no doubt that a series of compromises were made, but many of these are not well identified, particularly ex-ante, and their implications were not characterised nor well understood. Because compromises made through the process have not been well characterised they have not been well managed, in how they affect all parties. Compromises made were:
2. Starting with Rule 11, instead of zero basing. The section 32 report and the review of Rule 11 both identified that zero basing should have occurred. That this did not occur is not recorded as a compromise, and nor are the effects of this compromise on various land owners explored. This compromise immediately directed the policy choices to allocation, to using the existing land use as a base and thus to grandparenting.
3. To use a model that was deeply flawed for the task of N allocation at an enterprise level. The compromises required to use this model were not elucidated. Some attempt was made to explain how one version of the model was referenced against another, but most effort was put into justifying its use.
4. Allowing the solution to be developed by the group with the most to gain. This risk was not identified or elucidated.
5. Fully acknowledging one treaty settlement (Te Arawa Lakes 2006) and totally ignoring another (Central North Island Forests Land Collective Settlement Act 2008). This compromise was not even recognised as having occurred.
6. To ignore best and highest use for land in favour of securing the enduring rights of those presently creating the most pollution.
7. Using additional criteria to those of the RPS to choose the policy regime, even those these had no legal standing.
8. Council’s role is to actively shape the solution, taking guidance from ALL of those who will be affected, on matters where those so affected have more expert knowledge. This must be in the context of the superior regulatory and policy instruments it must work to. These are, in order of power: RMA, NPS-FM, and RPS. Council compromised in this regard by adding four further criteria to those of the RPS Policy WL 5B, and weighting these the same as the actual RPS criteria in making the decision on which allocation regime to use. While adding these extra four may have pacified some members of the Stakeholder group, these extra criteria had not gone through the formal rigour of a RMA Schedule One process. Thus they had no formal status and should have carried no weight. Instead, these appear to have significantly contributed to the policy chosen. Ref Section 32 report 10.2.1

*The allocation of nitrogen allowances is guided by policy WL3B and WL 5B…*

*StAG considered the following additional principles* [4 further] *for deciding the allocation method”*

1. Governance capture by a small subsection of StAG resulted in a policy that demonstrated a complete reversal from what most stakeholders wanted (S32 pg 44 section 6.6.5):

**Consultation feedback identified:**

1. *Those with high nitrogen losses* [9% of the catchment area] *tended to support grandparenting and/or sector ranges based on historic land use*
2. *Those with low nitrogen loss* [91% of the catchment area] *tended to support equal averaging or land use capability (natural capital)*
3. *Those with low nitrogen loss* [91% of the catchment area] *believe that sector-averaging allocation rewards the polluters*
4. *Pre-2001 mitigation, such as retiring land, needs to be recognised*
5. *Concern about the impact of the rules on ability to develop Māori Land*
6. *Unduly onerous nitrogen constraint on undeveloped land*

However, what changed as a result of feedback was:

1. *Completion of an NDA economic analysis report* - Elucidates the costs of those receiving the greatest allocation, but does not to identify the income forgone by those without allocation.
2. *Selection of preferred approach: sector averages with ranges based on Rule 11 benchmarking*,   
   despite this being preferred by only 9% of the catchment landowners.
3. *Staff working with Te Tumu Paeroa and Te Arawa to increase understanding of the issues for undeveloped Māori land.*   
   But the new plan further embeds the inequity set up by the previous plan – the rules of which were promised to be an interim measure only, until new and fairer rules could be developed.
4. The section 32 report for Plan Change 10 then describes how Council settled on the preferred option. The reasoning creates a self-referencing circle. A subgroup of StAG (LRPPC) created the Integrated Framework, which included additional criteria to the RPS Policy WL 5B and against which any option would be measured. The chosen option met approval once it was measured against the additional criteria. This circular referencing conveniently covers three of the five reasons for accepting the policy option.

*10.2.6* ***Preferred option***

*The preferred allocation approach is sector averages with ranges adjusted based on Rule 11 benchmarking.* Opposed by all by 9% of the land users.

*The sector average with ranges approach is preferred because it:*

*• Recognises existing land use and investment.* **2 of the 9 RPS policy WL 5B criteria**

*• Accommodates dairy support and intensive beef in a suitable drystock range.*

*• Meets the principles and considerations defined in the RPS.*  **Only 2/9 WL 5B**

*• Meets the principles adopted by StAG.* **Not an RPS criteria**

*• Allows the allocation to match the Integrated Framework commitment.* **Not an RPS criteria**

1. The section 32 report for Rule 11, and then the review of Rule 11 in 2009 explicitly identified that Rule 11 was an interim measure, deeply flawed, and that any subsequent rules should go back to first principles. This information was completely ignored in the section 32 report for Plan Change 10:

*9.2.2* ***Alternative option: Rule 11 (status quo)***

*The consideration of the status quo is a normal part of a section 32 process.*  *The status quo provides a baseline for options to be evaluated against.* [Unless perhaps the CBA and explanation of the previous rule has explicitly advised NOT to use it]. *In the case of nutrient management options for Lake Rotorua, the status quo is the regulatory environment created by Rule 11 in the RWLP. Rule 11 capped the existing nitrogen and phosphorus loss from properties within the Lake Rotorua catchment benchmarked for the average annual export of nutrients for the period 1 July 2001 to 30 June 2004.*

1. The Plan Change 10 Section 32 report evaluates the scale of impact of new provisions, but only in the context of beyond **what is already in effect as a result of Rule 11**. In terms of Māori Land the section 32 contends (Pg 177) that:

*Rule 11 has restricted intensification of farming practices in the Lake Rotorua catchment through benchmarking farms based on annual average 2001-2004 nitrogen discharges* ***and requiring that these do not increase****. The effect of this has been to* ***halt increases*** *in the amount of nitrogen entering the lake from pastoral land.*

1. Very little benchmarking occurred in the Lake Rotorua catchment at the time Rule 11 came into effect, or by the time of the review in 2009. Some properties are still not characterised. As far as preventing intensification, Council identified that the only technique they were using for compliance with Rule 11 was complaints[[36]](#footnote-36). There is no provision for any systematic compliance assessment of Rule 11 in the BOPRC compliance policy or Section 36 policy. Relying solely on complaints is not a systematic way of ensuring compliance with the rule. It relies on outliers being picked up, due to the public having a notion of what to be concerned about, and having the impetus to report their concern to Council. The new policy regime was built on the old one, on the basis that the old one was successful. Which can’t be measured due to lack of benchmarking and hasn’t been measured due to lack of compliance assessment. To start from this base point on the basis that the previously semi-successful-at-best regime, has actually been successful is a massive compromise. A whole new regime is acting to continuing to shut out a range of land uses to protect an existing few, some of whom are likely to have actively flaunted the old rules. Some elements of this compromise are elucidated – being reiterated from the review of Rule 11, but others, such as the massive constraint this puts on dynamic use of land and capital, are not. The section 32 continues with:

*Pg 178 Benchmarking under Rule 11 was based on annual average 2001-2004 nitrogen discharges. Rule 11 creates inequity in the primary production development potential that is available for undeveloped or under-developed land compared with established intensively farmed properties. Landowners who have developed the economic potential of their land (with consequent effects of nutrient export) are able to continue to enjoy that advantage, while those that have not are denied it. This may have had a disproportionate impact on multiple-owned Māori land, and on drystock farmers relative to dairy farmers. This is applicable only where the land is not being used to its full economic potential, and obviously not all land is fit for dairy farming, for example. A rule change would bring the opportunity to reassess allocation in the context of the principles and considerations provided in the Bay of Plenty Regional Policy Statement.*

*Rule 11 constrains multiply-owned Māori ancestral land to the extent that it prevents reasonable use and development of land. Rule 11 does not ‘credit’ landowners of Māori Land for the extent to which a property has minimised the amount of nitrogen discharged. There is a question as to whether the rule framework properly recognises and provides for the relationship of Māori with their ancestral lands and properly applies the principles of the Treaty of Waitangi as required by sections 6 and 8 of the RMA. This is because Rule 11 prevents intensification of the land to the same level as other land in the catchment and thereby constrains future economic opportunities*.

1. The section 32 report confidently states that Rule 11 has halted intensification of pastoral farming and conversion of forestry to farming in the catchment, but has not been effective in achieving the 435t limit set in the RPS (pg 182). Without benchmarking and frequent and regular assessments against the benchmark Council has no basis on which to state that within-sector intensification was halted. Assertions otherwise have no factual basis. Making such assertions demonstrates a lack of awareness of a significant issue with the existing policy and its implementation. This lack of awareness means Council is unlikely to accurately identify or reveal any compromises relevant to their next round of policy development.
2. Compromises that affect land value take a peculiarly one-eyed view, demonstrating that compromises are only visible to Council if they affect pastoral farmers. It identifies that dairy land values in the catchment reached a price of around $24,000/ha in 2014 while the price of forestry land is around $3000/ha[[37]](#footnote-37).

*This suggests that taking the best price for dairy land in the Lake catchment ($24,000/ha), on a land for land basis, the value lost by dairy farmers would be $105m.*

*Nitrogen discharge allowances effectively become part of the land value. Converting from dairy to forestry, a dairy farmer would also sell, on average 43.6kg N/ha. Based on the Lake Taupō sales of NDA at $400/kg, this would yield around $17,400/ha. Multiplied by 5000 hectares equals $87.2m. On this basis, the final loss across all dairy farms would be $105m less $87.2m = $17.8m.*

1. The compromise that is not shown in this analysis is the compromise made by those whose land is suitable for dairy farming but constraints beyond their control at the time of Rule 11 meant their land was actually in trees. The result of Plan Change 10 is to remove optionality, and to remove lease bargaining capability. The unwilling forester forgoes the NDA of 62kg/Ha @$400/kg AND their land value drops from an unimproved dairy price of (say) $20,000/Ha to $3,000/Ha. Should someone have 600Ha of such land, the value that they would lose is $25.6m. For the unwilling forester with 1917Ha of land capable of being used for drystock farming, they forgo the NDA of 23kg/ha @$400/kg losing $17.6m. The drop in land value for drystock is difficult to discern from the Telfer report. The unfortunate landowner with both dairy and drystock land that they cannot use conservatively estimates their total loss at $43m.
2. This compromise made by one land owner raises the question of whether those who have been subsidised produce a product of such value, that this subsidy is worthwhile. Is the value of what they produce so great for the economy that someone else should pay for the externalities of that cost of production? And is the opportunity cost caused by preventing other people doing other things sufficiently defrayed, that such a subsidy is worth it? The CNIIHL contention is that this compromise has not been accurately identified or scrutinised (refer the discussion on IRR and EBIT at para 31), and that it is so big as to be untenable.

**How does it provide clear signals of adaptive management - how does it identify and manage the risks associated with any future changes (that may or may not arise).**

1. CNIIHL has identified that in circumstances where there is considerable measurement uncertainty for the substance being allocated (N), that allocation is not a suitable policy regime. CNIIHL has identified that the modelling tool being used for this policy exercise is fundamentally unsuited to the task of accurately characterising N discharge. This means it cannot be successfully used in an allocation regime. Allocation as a policy regime does not lend itself to adaptive management. Council has left no stone unturned in its endeavours to shore up an unsuitable tool and an unsuitable regime. CNIIHL believes that that effort has only served to further prove the unsuitability of the mechanism and the regime. Grandparenting/sector averaging allocation and adaptive management are incompatible. The risks posed by changes to the amount of N that must be removed from the lake, and the portioning of N that each land user must be responsible for managing are large and live. Information will change as a result of better scientific understanding of the soil and nitrate processes and as the result of better modelling design and tools. Attempting to do linear cross-referencing between versions of an unsuitable model does not constitute adequate or appropriate adaptive management. Allocation of all N on the basis of a deeply flawed modelling process instigates s a rigid regime that creates enormously valuable property rights. As Ms Barnes’ evidence[[38]](#footnote-38) correctly points out this allocation system

*does move an open access resource into a private property rights system with attendant problems of determining and administering property rights*

1. The wealth transfer that this process sets in train is one whereby a very small proportion of land use in the catchment – approximately 9% - acquires a tradeable resource worth millions of dollars, the apportionment of which prevents other land users from exercising their ability to flexibly use their land at all.

**Conclusion**

1. CNIIHL believes the process Council used to arrive at an allocation regime demonstrated governance capture and thus is void. CNIIHL also believes it is void for reasons of natural justice, lack of consistency with the purpose of the RMA, lack of appropriate consideration of RMA Section 8 and lack of appropriate interpretation of RPS policy WL 5B.
2. CNIIHL believes that Council cannot persevere with a policy framework that uses allocation because it lacks the allocation tools to make these multi-million dollar allocations in a way that is fair, credible or defensible.
3. CNIIHL believes that the model Overseer is being used well beyond its zone of competence and its use should be restricted to that of a non-regulatory decision support tool.
4. CNIIHL believes that Council should replace the Plan Change 10 policy regime with one that uses polluter pays principles and practices.
5. Should Council persevere with an allocation regime, CNIIHL believes the only fair way to do so is to revise the regime to be based on natural capital, using a combination of land Use Capability and soil leakiness. Any such regime must also zero-base rather than start from Rule 11 benchmarks.

### Annex A - Proposed Regional Water and Land Plan Section 32 Record Council’s Decisions March 2004

To allow Environment Bay of Plenty to address the effects of discharges of nitrogen and phosphorus resulting from point source discharges on lake quality. This is to minimise the input of nitrogen and phosphorus into lakes and their catchments in order to achieve the Trophic Level Indices stated in Objective 10.

Applicants will need to identify and apply measures to mitigate or off-set any increased nutrient export resulting from the proposed activity. Resource consent applications for proposed activities that have the potential to increase the nitrogen or phosphorus levels in a lake catchment, after taking into account mitigation measures including off-site mitigation, that do not comply with the requirements of this plan will be declined. It is the intent of Council that the rules in section 9.4 (including Rule 11) will be reviewed according to Method 35A. Any changes to the rules will be through a publicly notified plan change process under the Resource Management Act 1991.

**Efficiency** *(section 32(3)(b))*

When used in conjunction with other methods, the rules are an efficient means of meeting the requirements of section 5; 6(a), (b), (c), (e); 7(aa), (a), (c), (d), (f), (h); 9(3), 15(1), 30(1)(a), (c)(ii) and (iiia), (f) and (ga), and 65(3)(f) and (h) of the RMA 1991, achieving Objectives 8 and 10, and implementing Policy 21(a) and 24.

It is recognised that the Rules in section 9.4 are part of a package of provisions in the plan necessary to maintain or improve lake water quality.

The rules will only be efficient and effective when implemented with Method 35 (Action Plans), Method 40 (Environmental Programmes), stormwater controls (refer to Objective 31B), and control of point-source discharges (refer to Policy 30).

It is efficient to exclude matters relating to septic tank discharges, as these are addressed by the On-Site Effluent Treatment Plan.

The current version of Rules 11A, 11B, 11C, 11D, 11E, and 11 **is an interim measure**. The intent of Method 35A is to **reconsider the applicability of the rules** relative to each individual lake and the outcomes from the Action Plans, **and develop rules appropriate to the individual catchment**.

Pg 347 The rules clearly distinguish between diffuse discharges (from land use activities) and point source discharges (e.g. stormwater, dairy farm effluent). This recognises the difference between Environment Bay of Plenty functions to control land use relative to sections 9(3) and 30(1)(c)(ii), which is limited to the control of the use of land for (among other purposes) the maintenance and enhancement of water quality, and Environment Bay of Plenty full control of point source discharges under sections 15 and 30(1)(f) of the Resource Management Act 1991.

There is a need to first understand what land uses in the catchment are fixed or potentially changeable. For example, DoC and RDC reserves are ‘fixed’ as there is unlikely to be land use changes, whereas exotic forest is changeable as there is no guarantee that the land will not be converted into pastoral grazing, etc. There is a need to assess the practicality and achievability of any limit set in a rule. The limit may not be achievable by high N and P exporting land uses, which may mean all dairy farms are immediately in non-compliance.

Would probably mean that all dairy farmers would be required to reduce their N and P exports, or pay a levy (i.e. financial contributions) where a maximum N and P level is set as an average throughout the catchment. It is recognised that nutrient models are not perfect, and that there is a high standard of error. Such models are valid measures for comparing changes in land use (i.e. the effects of extra stock units, etc) on the same property. As such models will never exactly determine what N and P exports are from a property, and landowners are likely to dispute the outcomes from any model where a rule set maximum nutrient levels. To accurately determine the N and P exports, extensive environmental monitoring would be required, which increases costs to landowners.

### Annex B – Good practice assumed by Overseer, but often not the case

|  |  |
| --- | --- |
| **Expectation** | **Rules required to support assumption** |
| **Overseer Assumes**  Precision fertilising - Nitrogen fertiliser applied in compliance with the Fertiliser Research Guide Code of Practice. | Precision fertilising does not routinely occur. In most cases records kept are poor. Proof of placement is not kept by fertiliser companies nor provided to farmers.  To “assume COP is in place” requires clear records of fertiliser applications in Kg per ha per year applied, and timing, relevant to each management block in Overseer. |
| **Overseer Assumes**  Best Management Practices for Effluent Management in place | Effluent discharge to land needs to be in accordance with the most recent BMP code applied for storage (sealed), application (using soil moisture deficit principles), and nutrient loading (max of 150 kg N per ha per year from all sources). |
| **Overseer Assumes**   * surface runoff of effluent and sediment does not occur from hot spots, crops, or poor soil management. * no contaminants enter groundwater. * No Direct connectivity to waterbodies | Clear recommendations or rules are required to manage the contaminant loads from fodder crops.  There is no definition nor rule for mob stocking on one paddock and loss of pasture cover. Control of the impact from sacrifice paddocks, mob stocking and risk of contaminant to ground and surface water in inclement weather events (similar risks to winter cropping). |
| Most N leached on livestock enterprises comes from the urine patches | If pasture cover is lost, and there is pooling in the area, and soil compaction/damage occurs, this increases the risk of preferential flow or runoff. |
| The more time animals spend on sealed surfaces in autumn/winter the greater the N loss reduction. Effluent can be captured and applied more evenly and at more appropriate times. | Overseer does not model herd homes appropriately. |
| **Overseer Assumes**  Stock exclusion from waterways | Surface runoff and connectivity to waterways is covered in Overseer, but it expects that there are riparian zones or buffer strips to do so, to ensure no direct pathways from stock camping areas and tracks enter waterways. |
| **Overseer Assumes**  Trapping and retaining nutrients and sediment in wetlands and vegetation buffers reduces direct contamination of waterways. | As above |
| **Overseer Assumes**  irrigation of effluent only happens in conditions of soil moisture deficit | Irrigating dairy effluent to soil moisture deficit reduces drainage and runoff of effluent nutrients. N remains in the root zone for longer where a larger proportion of available N is able to be utilised by the plant. This will require adequate pond capacity, based on pond calculator and accurate soil risk assessment for effluent application. All this is assumed to be in place, and in most cases is not. |
| **Overseer Assumes**  Crude protein not above 22% | Understanding of the correct profile of effluent N concentrations and what the loading rate should be. The effluent block must be of sufficient size to be able to spread the amount of effluent generated at a rate and concentration that avoids over -application of N.  The N in effluent increases with higher crude protein load in the diet. Excess crude protein (above 22%) in diet can increase urinary N excretion by 50+% above what Overseer assumes. |
| **Overseer Assumes**  sufficient effluent storage volume | The ability to irrigate effluent to soil moisture deficit is determined by the level of storage available. If effluent storage is not large enough to allow for deferred irrigation when soil moisture levels are high, then the user must irrigate when soils are too wet, which greatly increases N loss. |
| **Overseer Assumes**  Deficit and variable rate irrigation | Deficit and variable rate irrigation reduces the risk of sediment run-off and nutrient loss through drainage by keeping nutrients in the root zone which avoids excess leaching.  Overseer assumes BMP irrigation practices of deficit and variable rate irrigation. This requires monitoring of soil moisture deficits and irrigation scheduling to meet soil moisture deficit needs. Both of these have low actual uptake. |
| Overseer assumes no greater than 22 % Crude protein | In high legume pastures or highly N fertilised pastures in spring and summer this is closer to 30%. Overseer significantly underestimates the urea content of urine. |
| Use of cover crops during fallow period | All effort should be made to avoid bare soils. Cover crops reduce the amount of N leached during an otherwise fallow period for soil. |

1. Lake Rotorua Underutilised Māori Land Analysis prepared by Perrin Ag Consultants 16 May 2016 [↑](#footnote-ref-1)
2. Electronic copy available at: <http://ssrn.com/abstract=2485325> [↑](#footnote-ref-2)
3. # **Preventing Regulatory Capture: Special Interest Influence and How to Limit it pg 13** edited by Daniel Carpenter, David A. Moss

   [↑](#footnote-ref-3)
4. <http://www.lse.ac.uk/accounting/CARR/pdf/DPs/CARR_DP84-Martin-Lodge.pdf#page=18> [↑](#footnote-ref-4)
5. Capture Theory and the Public Interest: Balancing Competing Values to Ensure Regulatory Effectiveness Potter M.R., Olejarski A.M., PFister S.M. *International Journal of Public Administration* 37 638-645,2014. [↑](#footnote-ref-5)
6. Nutrient Trading in Lake Rotorua: Cost Sharing and Allowance Allocation Suzi Kerr and Kelly Lock Motu Working Paper 09-09 Motu Economic and Public Policy Research May 2009 [↑](#footnote-ref-6)
7. The Group purpose <http://www.rotorualakes.co.nz/vdb/document/852> [↑](#footnote-ref-7)
8. <http://www.rotorualakes.co.nz/why-do-we-need-rules> [↑](#footnote-ref-8)
9. Nutrient Trading in Lake Rotorua: Cost Sharing and Allowance Allocation Suzi Kerr and Kelly Lock Motu Working Paper 09-09 Motu Economic and Public Policy Research May 2009 [↑](#footnote-ref-9)
10. section 3.15.8 of the section 32 report on Rule 11, also at Annex A [↑](#footnote-ref-10)
11. <http://www.rotorualakes.co.nz/vdb/document/162> [↑](#footnote-ref-11)
12. <http://www.pce.parliament.nz/media/1274/land-use-and-farming-intensity.pdf> [↑](#footnote-ref-12)
13. <http://www.rotorualakes.co.nz/vdb/document/162> [↑](#footnote-ref-13)
14. CBA RWLP Rule 11 (Craig Welsh – Resource and Environmental Management Limited) Dec 2001 – Section 4.2 p17 [↑](#footnote-ref-14)
15. <http://www.rotorualakes.co.nz/vdb/document/891> [↑](#footnote-ref-15)
16. Stephen Lamb planning evidence para 95 [↑](#footnote-ref-16)
17. Rules on what would trigger such a change should be set up before it starts to provide better business certainty. [↑](#footnote-ref-17)
18. http://www.treasury.govt.nz/publications/research-policy/wp/2003/03-02/08.htm [↑](#footnote-ref-18)
19. Pers com John Hura, New Zealand Forest Managers, Turangi. [↑](#footnote-ref-19)
20. <http://www.rotorualakes.co.nz/integrated-framework> [↑](#footnote-ref-20)
21. Prediction of nitrogen loads to Lake Rotorua using the ROTAN model NIWA Ham 2010-134 pg29 [↑](#footnote-ref-21)
22. Accuracy = the proximity of measurement results to the true value. Precision = the repeatability, or reproducibility of the measurement [↑](#footnote-ref-22)
23. <https://en.wikipedia.org/wiki/Conceptual_model> [↑](#footnote-ref-23)
24. <http://www.pce.parliament.nz/media/1278/pce-water-quality-in-new-zealand.pdf> [↑](#footnote-ref-24)
25. <https://www.parliament.nz/resource/en-nz/50DBSCH_SCR56973_1/5823f5c329d3f556af2788544fed21dbda88bbe4> [↑](#footnote-ref-25)
26. OVERSEER%20Summary%20for%20Agriculture%20Committee%202013%20(1).pdf [↑](#footnote-ref-26)
27. <https://teamwork.niwa.co.nz/display/IFM/Final+Report+to+MBIE?preview=/24412232/27426856/FIFM%20FinalReport%202014-02-24%20FINAL.pdf> and <https://teamwork.niwa.co.nz/display/IFM/Overseer> [↑](#footnote-ref-27)
28. McDonald, M.G. and Harbaugh, A.W. (1988). A modular three-dimensional finite-difference ground-water flow model. USGS Techniques of Water Resources Investigations, Book 6, Chapter A1. Washington DC [↑](#footnote-ref-28)
29. Chunmiao Zheng and P. Patrick Wang (2006). A modular three-dimensional multispecies transport model for simulation of advection, dispersion and chemical reactions of contaminants in groundwater systems. (Release DoD\_3.50.A) by Department of Geological Sciences Department of Mathematics University of Alabama, Tuscaloosa, Alabama 35487-0338. [↑](#footnote-ref-29)
30. OVERSEER® Nutrient Budgets Technical Manual for the Engine (Version 6.2.3) [↑](#footnote-ref-30)
31. <http://www.rotorualakes.co.nz/vdb/document/694> [↑](#footnote-ref-31)
32. <http://www.crc.govt.nz/publications/Consent%20Notifications/HearingEvidenceWalterCClark.pdf> para 41 to 42 [↑](#footnote-ref-32)
33. <http://www.radionz.co.nz/news/rural/282599/world-class-soil-programme-'misused>' [↑](#footnote-ref-33)
34. Nudge: Improving decisions about Health Wealth and Happiness Thaler and Sunstien 2009 [↑](#footnote-ref-34)
35. <https://en.wikipedia.org/wiki/Steering_tax> [↑](#footnote-ref-35)
36. BOPRC letter to “Protect Rotorua” 19 Sept 2015 [↑](#footnote-ref-36)
37. Pg 202 Section 32 report, referring to The Telfer Young report [↑](#footnote-ref-37)
38. Statement of evidence Sandra Barnes Economic and Social Impacts para 39 [↑](#footnote-ref-38)