145 Planning Act 2008, s 6.
146 DEFRA *National Policy Statement for Waste Water* (n 43) at [3.3.8].
147 R McCracken (n 38) at 18.
148 O Woolley (n 44) at 239.
149 DCLG *The Planning White Paper* (n 1) at 63.
150 Ibid, at 61.
151 J Boswall (n 60).
152 R Harwood "The Planning Bill: infrastructure proposals" (2008) 10 JPL 1411, at 1422.
153 R McCracken (n 38) at 18. See also the discussion by H Bassford (n 14) at 156.
154 H Bassford (n 14) at 156.
155 R McCracken (n 38) at 18.
156 Ibid.
157 M Pitt "Infrastructure Planning Commission — Where to now?" (2010) 13 Supp JPL 5, at 13.
158 [2003] 2 AC 295, [2001] 2 All ER 929 (HL) at [60] per Lord Nolan.
159 DCLG *The Planning White Paper* (n 1) at 31.
160 For example the Monetary Policy Committee at the Bank of England sets interest rates. See B Kelly (n 9) at 11.



# Setting water quality limits: Lessons learned from regional planning in the Manawatu-Wanganui region

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## Introduction

The cumulative effects of resource use are degrading the quality of many New Zealand rivers and lakes. Given the current state of freshwater quality it is timely to consider how we can best utilise the planning framework of the Resource Management Act 1991 (RMA) to improve degraded rivers, such as the Manawatu River. Narrative descriptions of desirable water quality outcomes were applied in many first generation regional plans. However, broad narrative standards or objectives are difficult to achieve in practice and measuring the delivery of narrative environmental objectives is also problematic.[1] An alternative freshwater management approach is to translate narrative objectives into numeric objectives and to use these to define water quality limits, such as concentration based standards or catchment load limits and to provide a sound basis for measuring policy success over time through environmental monitoring. However, water quality standards have been used in regional planning for the Manawatu River catchment since 1998. So why, more than a decade later, is water quality in the Manawatu River still among the poorest in New Zealand?[2]

The rules of the 1998 *Manawatu Catchment Water Quality Regional Plan* were an early attempt at using numeric limits within the RMA planning framework. A second generation approach is the newly developed combined regional plan and regional and coastal policy statement for the Manawatu-Wanganui region, known as the *One Plan*. The *One Plan* contains numeric targets for all of the region's waters (including the

Manawatu River) developed from water quality indicators. These targets are neither objectives nor rules but are linked to water-body values through the *Plan* policies. The *One Plan* identifies values for all waters and each value is associated with a narrative management objective. Using a spatial framework of catchment-based water management zones, each zone has defined values and specific water quality targets, developed to provide for the values of that zone.[3]

Defining terminology is useful when discussing limits, standards, targets or indicators for water quality. The recently Gazetted *National Policy Statement for Freshwater Management 2011* (the NPS) defines a limit as the maximum amount of resource use available which allows a freshwater objective to be met. In the author's opinion this is consistent with the way water quality targets apply through the *One Plan* because the targets in the *Plan* were developed as numeric thresholds (limits) of acceptable water quality, which would provide for the water values sought by the *Plan* objectives. However, the NPS defines a water quality target as a limit which must be met at a defined time in the future and which only applies in the context of over-allocation. The *One Plan* targets (limits) are not timebound and apply to all waters, not just those that are over-allocated; therefore they do not fit the NPS definition of a target. This paper uses the term limit to refer to the numeric targets linked to values in the *One Plan*, in place of the term target, to avoid confusion with the definitions of the NPS. The NPS provides no definition of a standard (water quality targets were termed standards in the notified version of the *One Plan*). The definition used here is consistent with standards applied as rules under s 69 of the Act.

For clarity, the terms used in this paper to define water quality are as follows: *numeric objectives* are measurable objectives within a regional plan or policy statement which describe the intended environmental outcomes; *standards* are numeric limits applied as rules in regional plans under s 69 of the Act; and *limits* are numerical levels of water quality associated with resource use which allow objectives, values or outcomes to be met. Water quality *indicators* are the various measurable parameters that are mechanisms for the application of RMA tools such as limits,





standards or in some cases numeric objectives depending on the context.

Environment Canterbury's *Natural Resources Regional Plan* (the NRRP), at chapter 4, utilises measurable, numeric objectives and rules containing water quality standards that are linked to achieving those objectives in a hierarchical manner.[4] For example, Objective WQL 1.1 contains numeric values for the maximum percentage of nuisance algal cover of the river bed. To support the objective there are standards for dissolved nitrogen and phosphorus that are linked to the desirable level of algal cover defined by the objective.[5] From a science perspective, the hierarchical approach of numeric rules and objectives is a logical system for the application of water quality limits through regional policies and plans. There are also many planning advantages to numeric objectives and linked water quality standards. For instance, objectives have a life beyond the timeframe of the plan, they are overarching goals to guide the consideration of all activities, including those which can affect water quality but may not necessarily be subject to water quality rules (eg water allocation, river engineering activities, forestry or vegetation clearance). Numeric objectives provide clarity about the desired state of water-bodies for the community and numeric standards provide some certainty for resource users around the acceptability of activities requiring consent. Numeric objectives linked to values offer good guidance for dealing with non-complying activities that exceed standards, provide a clear basis for monitoring plan performance over time, and assist decision-makers in dealing with the cumulative effects of resource use on water quality.[6]

### *The difficulties in setting limits in regional planning*

The cumulative effects from agricultural land use are now identified as key concerns for freshwater management in New Zealand.[7] Although some commentators have suggested there are enough tools and mechanisms within the Act to enable councils to deal with cumulative effects,[8] in 2008 Philip Milne identified some of the difficulties faced by resource managers in setting limits in plans, or through the consent process. Many of these difficulties reflect either a requirement for sufficient information and good science to persuade decision-makers to impose limits, or the political difficulties inherent in setting limits on resource use. Despite these difficulties some regional councils have undertaken to set limits to manage cumulative adverse effects on water quality. In addition to the Environment Canterbury example, regional approaches utilising numeric water quality objectives have been included in Environment Waikato's *Regional Plan Variation 5* to protect the water quality of Lake Taupo, and Environment Bay of Plenty's *Regional Water and Land Plan Objective 11* which states a desired trophic level for each of the Rotorua Lakes. All regional councils are now required to set water quality objectives and limits under the Freshwater NPS. A hierarchical system of numeric objectives and rules similar to that now operative in Canterbury, combined with a spatial and values framework such as that underpinning the *One Plan* for the Manawatu-Wanganui region, provides a robust, defensible method for setting regional water quality limits. This paper concludes by recommending individual steps to develop such a system, informed by an exploration of the advantages and disadvantages of using water quality standards, rules and limits in the Manawatu-Wanganui region.

***Considerations for the development of appropriate water quality limits***

When comparing systems devised for the development of numerical objectives, standards or limits from water quality indicators there are a number of points for consideration:

1) one size does not fit all (ie locally relevant limits are crucial);
2) no system for applying water quality standards and objectives in regional plans will be perfect (ie not all the relationships between indicators used for standards and numeric objectives are clear or simple); and
3) not all possible water quality indicators are appropriate for use at the level of Plan objectives.

These considerations are explored in more detail below.

A one-size-fits-all approach to setting limits for freshwater management is unlikely to be locally relevant or defensible, potentially jeopardising the success of numeric objectives and linked standards. This is important when considering the future development of National Environmental Standards for water quality to support the Freshwater NPS. A many-to-many relationship of groups of standards and linked numeric objectives which vary according to different community water-body values and different physical catchment characteristics is more likely to be accepted and environmentally relevant. Others have identified the importance of a spatial framework in combination with good science to underpin numeric standards and objectives in regional plans and policies.[9]

***The relationships between water quality indicators***

Sound science is critical to understanding the ecological interactions between the indicators that can be applied as standards, limits or numeric objectives. Ideally, cause and effect relationships would exist between one or more standards (to control causes through rules) and each of the objectives (defined desirable effects). For example, algal growth on the bed of rivers (known as periphyton) is influenced by river flow, substrate size, stability, light availability, temperature, invertebrate grazers, and the concentrations of the plant-available nutrients nitrogen and phosphorus. In simple terms, when all other river conditions are suitable, as nutrient concentrations increase periphyton also increases. Nitrogen and phosphorus standards can be applied in order to achieve a numeric objective which states a desired maximum level of periphyton cover of a river bed.

In reality, simple cause and effect relationships between water quality measures are rare. Rivers and the aquatic communities they support are dynamic, complex ecosystems and water quality variables are often interlinked with each other. Not only can water chemistry affect biological communities but the reverse is also true; for instance, changes in periphyton can influence the physical and chemical properties of water by reducing dissolved oxygen at night and changing pH, affecting the suitability of the habitat for fish and invertebrates. These relationships can all be overridden by the impact of river flow and significant events such as floods or droughts. So any freshwater planning system needs to allow for consideration of biophysical complexity, yet be simple enough to enable effective implementation.

Because freshwater ecosystems are complex and multi-stressor relationships and interactions between water quality variables occur, not all water quality indicators will be suitable as numeric objectives in plans. Listed below are five criteria to test the suitability of indicators as numeric objectives. The criteria are:

1) The objective describes an environmental state which can be readily understood by a non-technical audience.
2) The objective is measurable.
3) The objective is defensible, scientifically-tested and generally accepted as fit for purpose.
4) The objective responds in a predictable way to resource use or the presence of contaminants.
5) The objective is directly linked to the values to be achieved.[10]

This paper contrasts two examples of the use of water quality limits and standards in the Manawatu River, and recommends a framework to set limits for water quality that encompasses aspects of three regional approaches and integrates the lessons learned from the Manawatu examples. In doing this the water quality limits of the *One Plan* are tested against the five criteria listed above to determine potentially suitable numeric objectives for the Manawatu River.

## The need for water quality limits

The effects of activities on freshwater and our understanding of the issues affecting water quality have changed over recent decades. Degraded water quality resulting from poorly treated industrial and municipal waste has been increasingly superseded by degradation caused by diffuse nutrient enrichment from urban and agricultural sources.[11] The issues have changed because:

1) the treatment of many point-source discharges has improved through better regulation and industry standards;
2) agricultural land use has intensified;[12] and
3) our understanding of the issues has improved through





better environmental monitoring and continued research (river water quality trend analysis and greater collection and availability of national and regional monitoring data have enabled better identification and explanation of these changes over time).

Freshwater monitoring and research clearly indicate that any environmental gains from reduced point-source pollution in New Zealand are overshadowed by increased diffuse pollution.[13]

At national and regional scales the proportion of pastoral land in a catchment is highly correlated with low water-clarity and increasing nitrogen and phosphorus concentrations.[14] Sewage and wastewater discharges are still a significant influence on water quality in some areas,[15] although the cumulative effects of diffuse sources of pollution on streams, rivers and lakes are undeniably the most challenging freshwater management issue in New Zealand today.[16] A number of commentators agree that to deal with the cumulative effects of diffuse pollution, regional councils need to undertake the first three of the four critical steps below:

1) Identify the resource.
2) Determine its capacity for use.
3) Establish limits to resource use.[17]
4) Implement changes in resource use to achieve those limits.

Not only is there an identified environmental need for water quality limits, but there is now a statutory requirement for regional councils to give effect to the Freshwater NPS. Policies in the NPS will compel regional councils to undertake the first three steps outlined above by setting water quality objectives, limits and in cases where objectives are not met or resources are over-allocated, to specify targets and implement methods to improve water quality within set timeframes. All of these steps will require continued monitoring effort and good science support. The NPS provisions relating to over-allocation of water quality resources will be particularly applicable in catchments like the Manawatu, where diffuse nutrient enrichment from intensive land use has been identified as the key contributor to degraded water quality.[18] The fourth step noted above is explored in the Manawatu case below which identifies that without effective implementation the integrity of any water quality limits can be undermined and compromised.

## Lessons learned from the Manawatu River

Many areas of the Manawatu catchment can be considered over-allocated for nitrogen, phosphorus, sediment and faecal contaminants largely as a result of diffuse agricultural sources, unsustainable hill-country land use, and in some cases direct discharges of waste.[19] High concentrations of contaminants in the river and its tributaries have reduced the health of aquatic ecosystems negatively impacting the river's life-supporting capacity.[20] On a national scale, soluble nitrogen and phosphorus concentrations in the Manawatu River and some tributaries ranked amongst the highest in New Zealand when compared with guideline values[21] and other national river data.[22] Nutrient trends in the Manawatu were consistent with increasing national trends in nutrient enrichment.[23]

Under suitable environmental conditions, unchecked nutrient enrichment of waterways can lead to nuisance growths of periphyton which adversely affect the ecological, recreational, aesthetic and cultural values of rivers and streams.[24] Nuisance growths change the physicochemical properties of the water, reduce the availability and quality of aquatic habitat, and cover the substrate with unsightly algal growth. In severe cases, periphyton-induced changes in physicochemistry and habitat can be lethal to aquatic invertebrates and fish.

Management of periphyton and nutrient enrichment in freshwaters to meet the wide-ranging needs of aquatic and human communities has been the subject of national debate.[25] The key mechanism for regional councils to control nuisance plant and algal growth, and subsequent deleterious effects on waterway values, is to control nutrients entering water from the landscape, particularly nitrogen and phosphorus, through the imposition of water quality limits.[26] The way in which water quality limits are expressed through regional plans can have a significant bearing on how successfully they are implemented to achieve water quality objectives. Having established the issue





and the need for a regulatory response, we next examine the advantages and disadvantages of two successive generations of plans for the Manawatu River.

## Water quality standards: the Manawatu Catchment Water Quality Regional Plan

In 1998 the *Manawatu Catchment Water Quality Regional Plan* (the Manawatu Plan) became operative, following a process which began in 1993, identifying degraded water quality and protection of the uses and values of the Manawatu River as key issues. Consultation with environmental and recreational users was focused on concerns about nuisance growths in the river and the risks posed to public health from bacteriological contamination. The Manawatu Plan's singular objective was to:

> Enhance surface water quality in the Manawatu catchment by the year 2009 to a level which meets the needs of all people and communities while safeguarding the life-supporting capacity of the water.

The Plan utilised s 69 of the Act by identifying water classes from sch 3 and setting numeric standards within the rules of the Plan.[27] The Plan also conferred a prohibited activity rule (Rule 6) for all consents which could not meet the various standards within the specified timeframes, the last of which were periphyton and phosphorus standards to be complied with by June 2009 (no consents were declined due to the prohibited activity status and the vires of Rule 6 was hotly debated, although no declaration from the Court was ever sought on this matter by any party).

The use of strict regulatory mechanisms in the Manawatu Plan might have been expected to confer a strong signal to decision-makers that further or continued discharge of contaminants was not consistent with the Plan's intentions. Although the numeric standards within the Plan's rules were more stringent than the largely narrative standards in sch 3 of the Act, and the impending prohibited activity status was a strong signal of intent, in the author's opinion the lack of any numeric objectives in the Manawatu Plan was one of the major hurdles to effective implementation of the water quality limits. Evidence to support this is presented in the following sections.

Others have argued the benefits of numerical water quality limits, and noted two major disadvantages to plans which contain numeric rules without linked numeric objectives and policies.[28] In such cases no guidance is provided to decision-makers on how to deal with non-complying activities as there is no clear, measurable description of the outcome that the plan is seeking. Additionally, quantitative policies and rules alone may not be enough to effectively manage cumulative effects, particularly from land use or other activities that do not sit within the water quality policy or rule framework. The Manawatu Plan had no numeric objectives, only standards within rules and policies. Below, I examine the Plan's implementation in light of the potential disadvantages of that approach.

### *Non-complying activities: the unexceptional exceptional circumstances paradox*

Twenty-five consents were granted to renew significant discharges to the Manawatu River since the *Manawatu Catchment Water Quality Regional Plan* was made operative (the definition of a significant discharge for the purposes of this paper is any discharge of treated human sewage effluent to water, any industrial or food-processing discharge, or any discharge of more than one contaminant relevant to the standards in Rules 1 or 2 of the Manawatu Plan: ie not a gravel-washing discharge where sediment is the only contaminant of concern). Of those 25 consents, 15 were granted non-complying activity status because they were known to, or were likely to, exceed the water quality standards, in particular the phosphorus and periphyton standards of Rule 2. These 15 discharges were all granted consent through the exceptional circumstances provision of Policy 2. Because the development of the Plan was a consultative and political process and the use of water quality standards was new and untested, a pragmatic way was sought to deal with situations that were outside the rules. Policy 2 used the same language as





the clauses of s 107(2) of the Act to define the allowable exceptions as many of the standards were similar to the effects defined in s 107(1). Misuse of these exceptions was not foreseen by the Plan's developers or decision-makers.

Exceptional can be defined as "out of the ordinary course, unusual, special".[29] Arguably, when taking a catchment-wide view, granting a high proportion of non-complying consents under the definition of exceptional circumstances makes that provision somewhat farcical. The exceptional circumstances noted in the consent decisions ranged from the prohibitive costs of complying with periphyton and phosphorus standards, to upstream water quality which already exceeded the standards (cumulative effects), to uncertainty about the data or uncertainty of the effects of the discharge in relation to the standards. In the author's experience, none of these circumstances were particularly special or unusual within the context of water quality in the Manawatu catchment; in fact most of the circumstances noted in each case were common to a number of consents.

The application of water quality standards in the Manawatu Plan was an attempt to use numeric water quality standards under a relatively young Resource Management Act. However, the common use of the exceptional circumstances provision during the Plan's lifetime undermined the ability of the Plan to improve water quality downstream of point-source discharges, an outcome contrary to the Plan's narrative objective. In some cases the utilisation of the exceptional circumstances provision as an out-clause resulted in cumulative adverse effects arising from the reconsenting of multiple non-complying discharges.

The Plan provided no clear guidance on how the objective of water quality enhancement was to be achieved or what level of water quality was required to meet the needs of people, communities or the life-supporting capacity of the water. So there were no measures against which to judge the merit (or otherwise) of applications for non-complying activities. If numeric objectives for the desired maximum level of periphyton growth or microbiological swimming grade for the river were developed alongside the standards, non-complying activities could have been considered directly against their effects on these objectives. Such a scenario would have allowed for an empirical assessment of the effects to inform the evaluative process for non-complying consents.

### *Addressing cumulative effects in the Manawatu*

The narrative objective of the Manawatu Plan made assessing non-complying discharge consents in catchments affected by cumulative degradation difficult. In some cases the cumulative effects of activities upstream of a discharge were regarded as the exceptional circumstances by which a consent was exempted from the water quality standards. This approach seems at odds with the intentions of the Plan which was strongly focused on addressing the effects of point-source discharges. Although diffuse pollution is a pervasive cause of water quality degradation in the Manawatu catchment, the Plan gave little regard to the necessity for controls on land use which affected water quality and without a common, overarching numeric objective; land use could not be assessed against measurable water quality outcomes.

Diffuse contamination from agricultural sources was identified within the Plan as a water quality issue, although the science at the time of the Plan's development was not advanced enough to understand the relative contributions of pollutants from land use versus direct discharges. The Plan attempted to mitigate non-point-sourced effects through non-regulatory encouragement of riparian planting and the regulation of discharges to land, plainly stating that non-point-sourced contaminants were difficult to regulate, measure or define. Because addressing non-point-source pollution was not a priority of the Manawatu Plan, this issue became a key consideration in the development of the second generation *One Plan*.

### *Planning success or failure?*

There are a number of factors which contributed to the failure of the Manawatu Plan to provide obvious or positive water quality outcomes. These factors can be divided into two categories: poor implementation, and inadequacies in the planning framework. There is no doubt that failure to implement the intentions of





the Plan on a consent by consent basis was a contributor to the undermining of the Plan's integrity through the Policy 2 exceptional circumstances provision. Two other inadequacies of the Plan's framework included the lack of measurable objectives and lack of spatial resolution. Schedule 3 water classes were applied from the Act to provide some spatial reference for the standards. However, the lack of clarity about the desired outcome at any particular point in the catchment meant the values of the receiving environment were often argued on a case by case basis. Subsequently there was no clear path to monitor the Plan's objective over time, and the intent of the Plan, although clearly articulated throughout the Plan's narrative, was not adequately carried through into the planning provisions. Additionally, the scientific basis and technical understanding of the issues were hampered by sparse river monitoring data.

With hindsight and a better scientific understanding of the issues it is easy to focus on the negative aspects of the Manawatu Plan and to overlook the successes which also deserve mention. The reduction in dairy effluent discharges to water over the life of the Plan was an important and successful outcome. At the outset of the Plan in 1998 there were 318 consents for dairy effluent discharge to water in the Manawatu catchment, by 2010 there were just two. Dairy effluent discharges to water were successfully phased out by alerting farmers to the impending change in the acceptability of discharges to water prior to the Plan becoming operative. This approach was backed up by the Plan's preference for discharges to land over water, and ultimately the water quality standards in the rules. Generally, as consents for dairy effluent discharge expired, farmers were given short-term consents to continue discharging to water (usually three years) whilst upgrading to a land irrigation system. The exceptional circumstances provision was not actioned for dairy effluent consents and few, if any, of these consents ended in a hearing.

Removal of dairy effluent discharges from waterways reduced direct phosphorus, nitrogen and faecal pathogen loads to the catchment's rivers and may have contributed to improved nutrient trends in the short term,[30] although this is speculative and any positive effects on overall water quality may have been masked by increased intensification and diffuse nutrient inputs over the same time period.[31] Removing dairy discharges from water does not completely remove adverse effects on water quality; rather, contaminants reach rivers via diffuse mechanisms such as overland runoff or subsurface leaching. Dairy effluent discharges to land would have contributed to diffuse effects on waterways, particularly during wet conditions, in high rainfall areas and on poorer soils. Changes in dairy management were then rolled out across the rest of the region, significantly reducing the number of direct discharges to water region-wide.

Some territorial authorities and industries responsible for significant point-source discharges in the Manawatu catchment did undertake plant upgrades to achieve some of the Rule 1 and 2 standards. Faecal pathogens were reduced in a number of point-source discharges through ultra-violet treatment systems, and biochemical oxygen demand (BOD) was reduced throughout most of the catchment. Too much BOD causes growths of what is commonly referred to as sewage fungus. This slimy growth, in conjunction with the BOD itself, reduces dissolved oxygen concentrations at night, and was responsible for fish kills in the lower Manawatu in the early 1980s.[32] Reduced BOD in point-source discharges as a result of a clean-up effort in the 1980s was reinforced by the Plan BOD standard and did result in improved BOD concentrations in the lower Manawatu River,[33] to levels which no longer caused widescale fish kills. Changes to effluent treatment systems that reduced faecal pathogens and BOD were considered more affordable than the upgrades needed to reduce phosphorus, as the Plan required by 2009, so compliance with these standards was more easily implemented than for phosphorus.

So how did the approach taken by the Manawatu-Wanganui Regional Council differ for the second generation planning in the *One Plan*? I explore the similarities and differences below.

## The *One Plan* approach

For the purposes of resource management and monitoring the





Manawatu-Wanganui region was split into 44 management units known as water management zones, defined in the schedules of the *One Plan*. The water management zones framework provided a basis to ensure that limits for water quality and value judgements for water-bodies were spatially relevant; an approach also recommended by other commentators on water quality limits.[34] The *One Plan* specified water-body values and narrative management objectives for each value, supported by the *Plan*'s Objectives and Policies. These values were defined for each water management zone and provided for by the water quality limits for that zone.[35]

Like the Manawatu Plan before it, the *One Plan* does not contain any numeric objectives. This may mean that the lack of clarity introduced by the broad narrative objective in the former plan is perpetuated in the latter. However, an important advantage the *One Plan* has over the Manawatu Plan is the detailed specification of water-body values for each management zone linked to the objectives in the *Plan*. Although the objectives are narrative, they are more specific than the broad goals of the Manawatu Plan and this may increase their effective use in the consent process. If an activity is unable to comply with the water quality limits, decision-makers can fall back to the objectives to determine whether the activity will have an adverse effect on the values of the receiving environment. Whether measuring activities for their effects on the values of the *One Plan* will be technically feasible or simple is yet to be thoroughly tested through the consent process. The disadvantages of continuing to rely on narrative objectives are that there is no clarity for resource users about whether consent is likely to be granted, and the assessment of an activity against the values could be viewed as subjective. Decision-makers will need to refer to the relevant policies, although it could be argued that less guidance is provided there for dealing with activities that do not meet the water quality limits than in the Manawatu Plan.

The *One Plan* policies direct the management of activities to maintain water quality where limits are met and enhance water quality where limits are not met. Although an exceptional circumstances provision in the notified version of the *One Plan* has been removed, the policies do provide a flexible approach in which decision-makers on point-source discharge consents must have regard to the water quality maintenance and enhancement policies, the water-body values, the cumulative effects (both point and non-point-source), and a number of other matters including whether best management practises are being used or if the discharger has adopted the best practicable option (BPO). Given that the Manawatu catchment (among others) continues to have degraded water quality from point-source discharges,[36] the policy framework for these consents could be considered too open to discretion, risking failure at implementation like the Manawatu Plan before it.

With two minor exceptions (there are two rules in the *One Plan* which use the water quality limits as permitted activity thresholds; these rules relate to discharges of water and stormwater, and are not within the scope of this analysis) the water quality limits within the *One Plan* are not linked to rules or associated with the implementation of standards as rules under s 69 of the Act. This is a key difference from the Manawatu Plan, which had a strong rule stream attached to the water quality standards supported by policies and non-complying and prohibited activity status. By contrast, the *One Plan* has no non-complying activity status for discharges to land or water. In not conferring this status there is a risk of implying that activities which exceed the water quality limits are generally acceptable. A discretionary status for all activities is too open to interpretation on a case by case basis, is unhelpful to decision-makers, provides no clarity to resource users on whether a consent is likely to be granted, and potentially risks undermining the objectives and policies.[37] Milne cautions that in cases where cumulative effects are approaching sustainable limits (or in the case of water quality in the Manawatu River exceeding sustainable limits), activities should not be left as discretionary for the reasons listed above.[38]

In this sense the *One Plan* approach to water quality limits is inconsistent with its approach to water allocation. For water takes within the core allocation limit the activity is controlled, for those outside the allocation limit the activities are non-complying. In this case the *Plan* provides clear guidance on which





activities are generally acceptable and which are not through the activity status. In the author's opinion the water allocation approach in the *One Plan* is consistent with the requirement for setting limits in the Freshwater NPS but the water quality policies require strengthening before they will achieve the same level of clarity or consistency.

One leap forward from the Manawatu Plan was the inclusion in the *One Plan* of rules for the control of intensive land uses such as dairying, irrigated sheep and beef farming, cropping and commercial vegetable growing, to manage the effects of diffuse contaminants. The non-regulatory methods for riparian management in the Manawatu Plan have been ineffectual in arresting water quality degradation from diffuse sources. A tougher regulatory approach was required. The *One Plan*'s shift in focus from point-sources (as in the Manawatu Plan) to control of land use to address the cumulative effects on water quality, was controversial and untested in river resource management. However, Environment Waikato (through *Variation 5*) and Environment Bay of Plenty (through *Objective 11*) had led the way in proposing regulation of land use for lake water quality.

The proposed *One Plan* has been amended by decisions subsequent to hearings which reduced the level of regulatory control of intensive land use. The amended version of the *Plan* is currently under appeal to the Environment Court and the manner by which water quality limits are applied in the *Plan* (as standards, targets or limits) and the level of regulatory control of land use, are two of the points of appeal to the Court. Changes to the water quality approach may yet occur through the mediation and Court processes.

### *Numeric objectives from water quality limits in the* One Plan

An approach that is unlikely to be within the scope of the *One Plan* appeals is the potential to elevate some of the water quality limits to the level of numeric objectives. In conjunction with an approach which applies the limits as rules (standards) and a non-complying status for activities which exceed the limits, numeric objectives would provide considerable clarity about what the *Plan* is trying to achieve in the long term across all activities which affect water quality (including point and non-point-sourced contaminants). Numeric objectives also provide a sound basis for monitoring policy effectiveness throughout the *Plan*'s lifetime and beyond.

As discussed earlier, not all water quality indicators are appropriate for use as numeric objectives. For example, the nutrient limits for nitrogen and phosphorus themselves are not important environmental outcomes to manage. It is the effect of nutrient enrichment on periphyton (algae) growth and other river values which are the outcomes these particular limits are intended to manage. The limits were developed to provide for a range of values at different levels depending on the individual water management zone.[39] The limits most closely related to the *One Plan*'s desired outcomes for rivers are *Escherichia coli* (*E. coli*) limits for faecal indicator bacteria, black-disc limits for water clarity, periphyton limits for algal cover and the macroinvertebrate community index (MCI) limits as a measure of the state of aquatic ecosystems.

As explored below, all four of these water quality indicators taken from the *One Plan* limits meet the suitability tests for consideration as objectives. The first test is that they describe an environmental state that can easily be explained to a non-technical audience. Some translation is required from the raw numeric objectives but essentially *E. coli* under the limit means the river is safe to swim in without an increased risk of illness; an alternative approach would be to use a microbiological swimming grade as the objective (ie good, fair or poor) with a supporting *E. coli* standard or limit.[40] Horizontal visibility which exceeds a minimum black-disc objective means the water is clear enough to see through (for swimmers and fish). Periphyton cover within a maximum limit means there is not a large amount of green slime on the river bed, and MCI above the limit means the type of aquatic bugs and insects which are expected for a given environmental state are present. Each of these objectives allows for the setting of a desirable level of environmental state that can be weighed against economic, cultural and social considerations.

The second and third tests are whether the objective is measurable and scientifically defensible. Each of these limits





proposed are currently monitored throughout the region's rivers using nationally accepted protocols. All four can be tested statistically for trends over time. The *E. coli*, water clarity and periphyton limits have nationally adopted guidelines on which the objectives can be based.[41] National guidelines for MCI have not been formalised but user guides and protocols for sampling are well documented, and the index and its variants are generally accepted as the best currently available measures to determine the state of aquatic macroinvertebrate communities.[42]

The fourth test relates to whether the objective responds in a known way to resource use or the presence of contaminants. All four numeric objectives are supported by a body of research literature and their response to the effects of discharges and land use have been widely studied. Elevating these four indicators (*E. coli*, water clarity, periphyton and MCI) to the status of numeric objectives in the *One Plan* would provide clear, measurable outcomes in relation to contact recreation, life-supporting capacity, trout fishery, and aesthetic values, thereby meeting the fifth and final suitability test.[43]

The adoption of numeric objectives for the Horizons Region would clarify the freshwater outcomes the plan is trying to achieve across all activities and greatly assist Horizons to meet the requirements of the Freshwater NPS. Numeric objectives would also further strengthen existing policy effectiveness monitoring over the long term.

## Conclusion

A hierarchical system of numeric objectives and rules is a logical, defensible system for the application of water quality limits using the RMA planning framework. The goal of setting water quality objectives is to provide clear, measurable outcomes that are locally relevant, value-based, and which allow for the cumulative effects of land use and discharges to be considered. Applying water quality indicators as numeric objectives, limits to resource use, or rules for resource users, provides a transparent threshold of acceptability and a pathway for dealing with non-complying activities.

The lessons learned from using water quality limits in the Manawatu-Wanganui region lead to the conclusion that, as resource managers, we need to go beyond dealing with cumulative effects using the three steps of; identifying the resource, determining its capacity for use, and establishing limits to resource use.[44] Seven integrated steps to assist in the development and application of water quality limits in regional policies and plans are recommended. These steps are:

1) Determine a spatial framework that accounts for environmental variability across and within catchments (eg topography, geology, and hydrology). Using this framework, identify the community values for water and develop water quality indicators that are associated with those values.
2) Thoroughly examine the relative contributions of contaminants from all sources to the allocation of water quality resources using sound science (note: the variability of water quality in relation to flow is integral to understanding the effects of activities on river systems).
3) Choose strong numeric objectives which will give clear guidance for the direction and intent of regional policies and plans. Test the water quality indicators to determine which are appropriate to elevate to numeric objectives using the five suitability criteria detailed above (note: the variability of water quality in relation to flow is integral to understanding the effects of activities on river systems).
4) Set limits to resource use and standards for resource users by using the remaining water quality indicators to develop standards (rules) which support the numeric objectives.
5) Develop an activity status framework that signals the acceptability (or otherwise) of activities that exceed the standards and link all activities that affect water quality to the numeric objectives. Ensure non-complying activities will be captured by the objectives.
6) Be clear and precise in describing any exceptions to the rules. Expect that any exceptions in water quality policies will be challenged.
7) Regularly audit the effectiveness of implementation against the plan's intentions and objectives to ensure the integrity of the objectives and policies are not undermined.





These considerations will become progressively more relevant to all regional councils grappling with managing the cumulative effects of land use and other activities on freshwater quality in New Zealand and with fulfilling the requirements of the Freshwater NPS.

## Acknowledgements

This study was made possible by funding from the RMLA and Horizons Regional Council and was undertaken as partial fulfilment of a Master's degree in Applied Science (Natural Resource Management) at Massey University. The author is grateful to a number of people who contributed thought-provoking discussion including Clare Barton, Helen Marr, Barry Gilliland, Peter Taylor and particularly Ned Norton. Maree Clark is credited with the analysis of changes in dairy discharge consents over time, and aided in the assessment of point-source discharge decisions under the Manawatu Plan. I am thankful for the assistance of my supervisors John Holland, Jon Roygard, John Quinn and Russell Death.

*Kate McArthur was jointly awarded the RMLA Scholarship 2010.*

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