

In the Environment Court
at Wellington

under: the Resource Management Act 1991

in the matter of: appeals under clause 14 of the First Schedule to the
Resource Management Act 1991 concerning proposed
One Plan for the Manawatu-Wanganui Region

between: **Federated Farmers of New Zealand**
(ENV-2010-WLG-000148)

and: **Minister of Conservation**
(ENV-2010-WLG-000150)

and: **Horticulture New Zealand**
(ENV-2010-WLG-000155)

and: **Wellington Fish and Game Council**
(ENV-2010-WLG-000157)

and: **Andrew Day**
(ENV-2010-WLG-000158)

Appellants

and: **Manawatu-Wanganui Regional Council**
Respondent

and: **Fonterra Co-operative Group Limited**
Section 274 party

Statement of evidence in reply of **John Stacey Ballingall** for Fonterra Co-
operative Group Limited

Dated: 18 April 2012

REFERENCE: John Hassan (john.hassan@chapmantripp.com)
Luke Hinchey (luke.hinchey@chapmantripp.com)

**STATEMENT OF EVIDENCE IN REPLY OF JOHN STACEY
BALLINGALL FOR FONTERRA CO-OPERATIVE GROUP LIMITED**

INTRODUCTION

- 1 My full name is John Stacey Ballingall and I have the qualifications and experience described in my Evidence in Chief (*EIC*). I repeat the confirmation given in that statement that I have read and agree to comply with the Code of Conduct for Expert Witnesses.
- 2 In this statement of evidence I respond to the evidence of Dr David Kenneth Vawdrey Marsh and Alison Dewes who appear for the Wellington Fish & Game Council (*Fish & Game*), Phillip Harry Percy for Andrew Day, and Helen Marie Marr who appears for Fish & Game and the Minister of Conservation (*the Minister*).
- 3 I have participated in expert witness conferencing with the other witnesses who gave evidence on economics issues, Dr Marsh, and Mr Jeremy Neild and Mr Antony Rhodes for the Manawatu-Wanganui Regional Council (*Council*). The outcome of this conferencing is set out in the Record of Technical Conferencing on Economic Sub-Topic in Relation to Surface Water Quality – Non-Point Source Discharges dated 20 March 2012 (*Record of Technical Conferencing*).
- 4 The fact this statement in reply does not respond to every matter raised in the statements of other parties within my area of expertise, or every witness raising those matters, should not be taken as acceptance of the matters raised. Rather, I rely on my EIC and this reply statement to set out my opinion on what I consider are the key issues concerning economic matters in relation to the Council's Proposed One Plan (*POP*).

SCOPE OF EVIDENCE

- 5 My evidence will consider:
 - 5.1 The issues raised in Dr Marsh's evidence relating to:
 - (a) The on-farm costs of regulation;
 - (b) Regional and national flow-on impacts of regulation; and
 - (c) The use of "Willingness To Pay" and "Willingness To Accept" measures of the benefits of improved water quality.
 - 5.2 The N-loss trading scheme proposed by Mr Percy; and

- 5.3 The issues raised in Ms Marr's evidence relating to her section 32 analysis of the nitrogen limit options.

EVIDENCE OF DAVID MARSH FOR FISH & GAME

- 6 Dr Marsh's evidence is a useful theoretical starting point for considering the costs and benefits of the alternatives, although, as I argue below, much work remains to be done before it is possible to make any firm conclusions about the net benefits or costs of the alternative approaches put forward by the parties in this case.

On-farm costs of regulation

- 7 Dr Marsh criticises the 2009 Neild and Rhodes estimates of on-farm costs as being overestimates for two main reasons (paragraphs 32-34):

- 7.1 Some mitigation strategies might deliver productivity improvements that would partially offset their costs;
- 7.2 The case study farms were not a representative sample and instead focused on "challenging" farms.

- 8 In principle I agree with Dr Marsh's view that some cost increases could be offset by productivity improvements associated with some mitigation strategies.

- 9 However, in practice, I understand from Dr Ledgard's rebuttal statement that there are few examples of mitigation strategies that improve productivity and profitability to any great extent.

- 10 Dr Marsh refers to stand-off pads as an example of a mitigation strategy that would improve productivity, and cites Alison Dewes' evidence. However, Dr Ledgard states in his rebuttal statement that the use of stand-off pads will not unambiguously improve profitability. He cites research from Massey University showing that the use of stand-off pads can cause production decreases due to reduced nutrient recycling, which can more than offset the productivity increases associated with improved pastures. Dr Ledgard also notes that research shows that brought-in supplementary feed does not necessarily lead to an increase in farm profitability. I note my understanding that stand-off pads require relatively high capital cost (Neilds and Rhodes estimate around \$200,000 (page 1464, TEB), Monaghan estimates typically \$100-200 per cow or \$50-\$100 annualised (page 1958, TEB).

- 11 Based on Dr Ledgard's evidence, Dr Marsh's claim that the Neild and Rhodes cost estimates are overstated, due to a failure to consider the productivity improvements associated with some mitigation strategies, appears to be overplayed. While, in theory, any such productivity improvements should indeed be considered in

determining the net costs of mitigation strategies, in practice there appear to be few examples of where this is a likely outcome.

- 12 I also agree that taking the costs from selected "challenging" farms and extrapolating across all farms in the region is likely to result in the costs being overstated, as some farms will have lower N-loss mitigation options available to them. As Neild and Rhodes themselves (2009, p31) stated, "*It is important to acknowledge that the case studies represent a potentially biased sample of farms*".¹ However, there is little sense of the potential degree of bias involved.
- 13 Dr Marsh prefers to employ cost estimates from a study of the Waikato region² that indicates a \$25 to \$62 annual per hectare cost of achieving a 20% to 30% reduction in N-leaching, compared to \$78 to \$88 from the Rhodes and Neild work. This equates to a region-wide cost of \$1.8-\$4.4 million per year, compared to the \$5.9 million from Rhodes and Neild.
- 14 I am not an expert in farm cost modelling and simply note that this research was not carried out in the Manawatu-Wanganui region. Dr Marsh assumes that the abatement costs from the Waikato are applicable to the Manawatu-Wanganui region. However, no justification is provided for this assumption.
- 15 Dr Ledgard notes in his Evidence in Reply that the Doole and Pannell (2011) work probably underestimates the costs of N-leaching mitigation, particularly for moderate-to-high levels of reduction and refers to some examples of the cost implications from Tier 1 mitigation measures that he recommends be adopted by farmers in the top 25% range of regional N-loss performance. As a consequence, the extrapolated cost for the Manawatu-Wanganui region of \$1.8 - \$4.4 million is also likely to be underestimated.

Regional and national flow-on impacts of regulation

- 16 Dr Marsh notes (paragraph 37) that the "*[a]ssessment of regional and national level impacts needs to take into account of the secondary ('knock on') effects of regulation*". As presented in my EIC, I agree that any analysis of the costs of on-farm regulation needs to consider the flow-on costs throughout the regional economy, given how intertwined the dairy sector is with other sectors such as machinery repairs and veterinary services.

¹ Neild, J. D., & Rhodes, A. P. (2009). Economic Impacts of Proposed One Plan LUC Nitrogen Leaching/Run-Off Values on Behalf of Horizons Regional Council.

² Doole, G. J., and Panell, D. J. (2012). 'Empirical evaluation of non-point pollution policies under agent heterogeneity: regulating intensive dairy production in the Waikato region of New Zealand'. *Australian Journal of Agricultural and Resource Economics*, 56(1).

- 17 It was agreed by all parties at Technical Conferencing that “there will be off farm effects”.³
- 18 However, Dr Marsh does not actually take into account these costs in his analysis. He notes, in paragraph 37, that there may be some displacement effects if intensive dairy farming is more tightly regulated than other activities, with intensive dairy shifting to other regions. By itself, this would clearly represent a cost to the region. However, as Dr Marsh also points out (paragraph 38) this loss would be partially offset by the use of the land previously occupied by intensive dairy farming for other purposes.
- 19 This is a standard general equilibrium modelling result – resources shift between sectors in response to changes in policy settings and the costs that they impose. However, this adjustment is unlikely to be immediate or without cost. If it takes (say) one year for the land previously used by intensive dairy to be converted into a sheep and beef farm or into dairy grazing, then the value of the output foregone represents a loss to the region.⁴ This cost is not taken into account by Dr Marsh.
- 20 Dr Marsh refers to a paper by Rae and Strutt⁵ to conclude that *national* level dairy regulations to reduce N-leaching would have minimal impacts on GDP, presumably to make the point that the flow-on effects throughout the rest of the economy would be inconsequential.
- 21 In my view, this paper is not very relevant for informing a discussion on *regional* costs and benefits. The model used by Rae and Strutt has no regional component at all. The analysis is carried out at the national level. All regions are subject to the same regulatory settings. This is nothing like what is being considered in the Horizons POP case, where regulation is only put in place for one region.
- 22 The model cannot consider how tighter regulation in one region might detrimentally affect its competitiveness and production relative to other regions. For example, tighter regulation in the Manawatu-Wanganui region would make it less competitive compared to the Hawke’s Bay, Taranaki, Wairarapa, etc. This would see dairy production and employment shift to those regions. As per paragraph 19 above, if it takes some time for the intensive dairy

³ Topic 3, ‘Regional Impact’ in the Technical Conferencing Report.

⁴ I use one year illustratively. The precise time for conversion taken is not the critical part of my argument here – merely that the change would not be instantaneous and would thus be associated with some loss of production.

⁵ Rae, A. N., and A. Strutt. (2011). ‘Modelling the impact of policies to reduce environmental impacts in the New Zealand dairy sector’. University of Waikato Working Paper in Economics 04/11.

land to be used for other purposes, there could be real losses to the Manawatu-Wanganui region.

23 The Rae and Strutt paper uses a static model that compares 'before regulation' and 'after regulation' scenarios. It is unable to take into account the transition costs of moving between these scenarios.

24 The authors themselves (Rae and Strutt, 2011, p25) make it clear that using a national level model cannot provide all of the answers:

"a shortcoming of this and other global models is that they are able to model impacts at only the national level. Therefore there will be an important role for complementary analyses of impacts and policies at a more local geographic level, involving for example regional models of the New Zealand agricultural economy"

25 Finally, Dr Marsh contends that the slight negative GDP impact reported by Rae and Strutt *"could easily be overshadowed by even a very slight increase in demand for sustainable dairy products on world markets"* (paragraph 41). However, Dr Marsh does not substantiate this statement with any studies or data.

26 It is hard to see why overseas purchasers of Fonterra's ingredients exports (whole milk powder, etc) would be worried about the water quality of the region from which that milk was produced. And overseas consumers of final products (yoghurts, cheese, etc) would first need to know that water quality had improved (which is hard to do without some international labelling scheme that incorporates water quality standards), and secondly be persuaded that this improvement was actually worth paying a premium for.

27 More generally, as I understand it, the international evidence on sustainability premia is very mixed. Much depends on the availability and quality of information on the environmental 'performance' of products to consumers. As far as I am aware, there are no water quality labelling schemes in place for food products.

28 In summary:

28.1 The on-farm costs used by Dr Marsh appear to be somewhat understated. In addition, it should be noted that these estimates are from the Waikato region, rather than being based on actual studies of farms in the Manawatu-Wanganui region.

28.2 The on-farm costs presented by Neild and Rhodes may be overstated, depending on the degree of bias associated with

them not looking at a representative sample of farms in the Manawatu-Wanganui.

- 28.3 Dr Marsh does not appear to consider that there will be any off-farm costs of any significance related to regulating the dairy sector in the Manawatu-Wanganui region. I find his support for this assertion to be unconvincing.

The use of Willingness To Pay (WTP) and Willingness To Accept (WTA) measures

- 29 In my view, the approach taken by Dr Marsh to estimate the benefits of improved water quality in the Manawatu-Wanganui region is highly problematic. As I will expand on below, this is for the following reasons:

- 29.1 The theoretical justification for using WTA over WTP doesn't stack up in reality when considered in the context of the Resource Management Act 1991 (*RMA*);
- 29.2 The use of a WTA estimate from the Hurunui river has been crudely applied to the Manawatu-Wanganui region;
- 29.3 The WTA estimate used is almost five times higher than the average of studies presented elsewhere in Dr Marsh's evidence and there does not appear to have been any international benchmarking to check whether this estimate seems reasonable;
- 29.4 The WTA estimate is a "preliminary result" from an unpublished paper; and
- 29.5 The issue of potential job losses significantly reducing households' WTP/WTA (and hence the economic benefits of improved water quality) is not adequately explored.

Summary of Marsh's approach

- 30 Dr Marsh uses a WTA estimate from a survey of residents in Canterbury that asked how much households would need to be compensated from a deterioration in the water quality of a Hurunui tributary from 'not satisfactory' to 'poor'.
- 31 The "preliminary" results indicate that each household would require compensation of \$282 in order for them to accept this deterioration.
- 32 Dr Marsh then assumes that households in the Manawatu-Wanganui region would have the exact same preferences for water quality as those in the Hurunui region. He multiplies this \$282 by the 93,200 households in the Manawatu-Wanganui region to reach a WTA (or benefits of improved water quality) figure of \$26 million for the Fish & Game proposed approach.

Comment on WTP/WTA technique

- 33 The use of non-market valuation techniques to estimate environmental benefits is widespread in the international literature, and as Dr Marsh notes has been used extensively in overseas policy making decisions.
- 34 I agree that, if appropriately designed, WTP/WTA surveys can provide a useful way of estimating the potential benefits of water quality improvements. However, as with all economic studies, the devil is in the detail, and it is important that users are aware of the technique's limitations and the way that figures are generated and employed.
- 35 A key point to note is that the use of hypothetical markets to generate economic values for environmental assets has often been criticised for being unrealistic due to the disparity between stated and 'real' expenditures. Individuals' or households' stated values (such as WTA/WTP) tend to be much higher than what they would actually spend.⁶
- 36 For example, List and Gallet (2001)⁷ undertook a meta-analysis of studies of hypothetical and real expenditures. Their overall conclusion was that "*our empirical findings suggest that on average subjects overstate their preferences by a factor of about 3 in hypothetical settings*".
- 37 A similar degree of hypothetical bias was found by Murphy et al (2005)⁸ who found that the mean ratio of hypothetical to actual was 2.6.
- 38 I understand that there are few circumstances where WTP/WTA methods have been considered by the Environment Court. I have been advised that the use of WTP/WTA in Environment Court proceedings will be discussed in the submissions to be presented on behalf of Fonterra. This reflects in part the fairly limited number of case studies that have been carried out in New Zealand, relative to overseas jurisdictions.

⁶ See NZIER. (2010). 'Realistic valuations of our clean green assets'. NZIER *Insight* no.19.
<http://nzier.org.nz/system/files/sites/nzier.live.egressive.com/files/NZIER%20insight%2019%2020Realistic%20valuations%20of%20our%20clean%20green%20assets.pdf>

⁷ List, J. A., and Gallet. (2001). 'What Experimental Protocol Influence Disparities Between Actual and Hypothetical Stated Values?' *Environmental and Resource Economics* 20: 241–254.

⁸ Murphy J et al. (2005). 'A Meta-Analysis of Hypothetical Bias in Stated Preference Valuation'. *Environmental and Resource Economics*, 30(2005):315–25.

Which is the more appropriate measure: WTA or WTP?

- 39 Dr Marsh discusses two options for estimating the benefits of improved water quality (paragraph 52):

The maximum amount an individual is willing to pay (WTP) for obtaining a benefit or avoiding a loss reflects the individual's preferences for the loss or gain. The minimum willingness to accept (WTA) measures the compensation necessary for the individual experiencing the loss.

- 40 The choice of measure used has a critical impact on the estimated size of the benefits of improved water quality. As Dr Marsh points out, WTA estimates are usually an order of magnitude larger than WTP estimates. This is partly because there is no income constraint when an individual is asked how much they would need to be compensated for a deterioration in water quality (a WTA), whereas there is a budget constraint if they were asked how much they would be willing to pay to avoid that deterioration (a WTP).
- 41 Another reason for the difference between WTP and WTA is the endowment effect. People generally require greater compensation for potentially losing something that they already have than they are willing to pay to potentially gain something in the future.
- 42 In Dr Marsh's evidence, a WTP estimate of \$6.5 million for the Manawatu-Wanganui region is presented in paragraph 112 and footnote 9. This is calculated using a 2005 WTP estimate for Canterbury rivers and multiplying it by the number of households in the Manawatu-Wanganui region. I acknowledge that this estimate was presented only for indicative purposes, since Dr Marsh prefers to use WTA.
- 43 Dr Marsh's WTA estimate for the Manawatu-Wanganui region is \$26 million – four times higher than the rough WTP estimate. That is why he considers that regulation is required.
- 44 Clearly the choice of which measure to use is a vital decision. Dr Marsh discusses this choice in his evidence, and correctly concludes that:

Where property rights are clearly defined, WTA provides the correct measure of compensation for a loss in environmental quality (paragraph 97)

However, 'tragedies of the commons' (water pollution, air pollution, etc) exist precisely because property rights are poorly defined.

- 45 Dr Marsh believes that the RMA confers clear property rights on households for clean water.

In this case the size of the benefit depends on the assumption made regarding property rights. Assuming that the citizens of the region have the right to clean water, the correct measure of benefit is willingness to accept (WTA) (paragraph 98).

- 46 He bases this assumption on the purpose of the RMA i.e., to promote the sustainable management of natural and physical resources. I understand that Fonterra’s legal counsel will discuss this issue in more detail, however I note the RMA does not specify a “right to clean water” but defines sustainable management as:

*“sustainable management means managing the use, development, and protection of natural and physical resources in a way, or at a rate, **which enables people and communities to provide for their social, economic, and cultural well-being** and for their health and safety while—*

(a) sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and

(b) safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and

*(c) **avoiding, remedying, or mitigating any adverse effects of activities on the environment**” [my emphasis]*

- 47 The two sentences emphasised are important in that there is a broader definition of well-being (which includes economic well-being) and there is a compensatory mechanism built into the RMA. As Kerr (2003)⁹ notes:

*All of the previously mentioned studies have occurred in support of resource allocation decisions. They have been attempts to identify the most efficient outcomes in order to determine whether some specific action is desirable. **No studies have been undertaken to assess compensatory damages. Indeed, this type of action appears to be precluded by Section 17 (2) of the RMA.** Negative environmental effects must be avoided, remedied or mitigated (RMA, Section 17). Mitigation is the third potential use of non-market valuation procedures” [emphasis added]*

- 48 The RMA, therefore, does not confer a right to clean water (or air or land) but provides communities with the flexibility to define what

⁹ Kerr, G. N. (2003). ‘Extra-market values and water management in New Zealand’. Presented to Australian Agricultural and Resource Economics Society Fremantle, Australia February 2003.

sustainable management means for them and set appropriate levels of environmental quality.

- 49 Given the property rights issue is far from conclusive, the choice of the much higher WTA (\$26 million) over the more conservative WTP (\$6.5 million) as the most appropriate estimate of the benefits of improved water quality must also be less clear-cut than Dr Marsh asserts.
- 50 In this context, WTP would seem to provide a more appropriate measure of value than WTA. Using WTP would minimise any bias associated with stating a compensation value and expecting this as a 'mitigation' value under the RMA.
- 51 In addition, as outlined below, the choices presented to survey respondents in the Hurunui study were about receiving compensation for water quality deterioration – i.e. losing something they already had. In the POP case, all proposals are expected to improve water quality to varying degrees. As such, one would expect that the choices put to households in the Manawatu-Wanganui region would be about the willingness to pay for an improvement.

Problems with benefit transfer

- 52 As noted above, Dr Marsh has relied on an estimate of WTA from the Hurunui River and extrapolated that to all households in the Manawatu-Wanganui region to get a sense of the benefits of improved water quality from Fish & Game's proposed approach. The use of one region's WTP/WTA estimates to infer conclusions for another region's preferences is known as 'benefit transfer' or 'value transfer'.
- 53 The use of benefit transfer – when done correctly – is an accepted technique that can prove to be cost-effective in providing non-market valuation information to decision-makers. It is a useful approach when both time and budget are limited meaning that primary research cannot be conducted.
- 54 However, it has some limitations that need to be acknowledged, particularly when it is being used to inform major decisions. As EFTEC (2010, p3)¹⁰ state:

"Value transfer is not feasible if: The accuracy requirement is high (e.g. high impact – high profile project, design of an environmental tax)".

¹⁰ EFTEC. (2010). 'Valuing Environmental Impacts: Practical Guidelines for the Use of Value Transfer in Policy and Project Appraisal: Summary of Value Transfer Steps'. Report to DEFRA. <http://archive.defra.gov.uk/environment/policy/natural-environ/using/valuation/documents/summary-steps.pdf>

This suggests that for the Horizons POP case, which I consider to be a 'high profile project', transferring the benefits of improved water quality from the Waikato to the Manawatu-Wanganui region is unlikely to be appropriate.

- 55 However, if benefit transfer is to be used, there are three different approaches which might be adopted, ordered below from the most basic to the most rigorous (OECD 2002)¹¹:
- 55.1 the transference of mean unit values;
- 55.2 the transference of adjusted unit values; and
- 55.3 the transference of a demand function.
- 56 The simplest approach to benefit transfer is the use of mean unit values. This involves taking an estimate of WTP/WTA from one region and applying it to another without making any adjustments. This approach is subject to numerous concerns. First, the environmental change in the original study may be different to the change in question in the new region. Second, it does not adjust for different socio-economic profiles between regions. Third, the availability of substitutes – which will affect households' WTP/WTA – may differ between regions. For example, if one stream is degraded but there are others nearby that could be used instead, we would expect WTP/WTA to be much lower than if there was only the one degraded stream available for use.
- 57 A slightly more rigorous alternative is the adoption of an adjusted unit approach. In this approach, the original region's estimate is adjusted to reflect the new region's socio-economic characteristics, different starting points for the environmental change, the availability of substitutes, etc.
- 58 The most rigorous approach to benefit transfer – the transference of a demand function – involves using the demand function estimated in the original study and using the new region's data as inputs. However, the suitability of this approach depends largely on whether there is sufficient data available to develop a transferable demand function.
- 59 The method of benefit transfer presented by Dr Marsh is the transference of mean unit values and is the most basic form that can be undertaken i.e. taking a value from one site (Hurunui) and transferring it, without adjustment, to another site (Manawatu-Wanganui).

¹¹ OECD. (2002). *Technical Guidance Document on the use of socio-economic analysis in chemical risk management decision making*, ENV/JM/MONO(2002)10, OECD, Paris.

- 60 The original study that Dr Marsh's value is based on is a study of the Hurunui River, which is a very dissimilar location to the Manawatu River. As Table 1 shows, the two sites are quite different both in terms of age, income, ethnic mix and the current quality of the rivers.

Table 1 Source site and destination site differences

Measure	Hurunui	Manawatu-Wanganui	Source
Median annual income	\$23,000	\$21,600	Statistics New Zealand, 2006 Census
Ethnicity	76.2% European 4.9% Māori Other 18.9%	63% European 17% Māori 20% Other	Statistics New Zealand, 2006 Census
Age	41.3 years	36.7 years	Statistics New Zealand, 2006 Census
Water clarity (m)	2.38-2.4p	1.21-1.72	MfE*
E-coli	120.9-947.7	1360.7 - 2041.7	MfE*

* <http://www.mfe.govt.nz/environmental-reporting/freshwater/river/league-table/clarity-ecoli.html>

- 61 As the income figures show, Manawatu residents earn less than Hurunui residents on average. This would suggest that Manawatu residents' WTP would also be lower – they have less income to consider foregoing to avoid water quality deterioration.
- 62 There are also considerable differences between the types of waterways in the two regions. In August 2007, the Minister for the Environment received an application for a Water Conservation Order to be made on the Hurunui River.¹² The applicant was the New Zealand and North Canterbury Fish & Game Councils and the New Zealand Recreational Canoe Association. The application was withdrawn in 2010 as a commitment of the parties to the collaborative process under the new Canterbury Water Management Strategy.
- 63 The application shows that the Hurunui River has outstanding values that may require protection. The Manawatu River is not subject to a Water Conservation Order or application. Values derived in the Hurunui case may be high given its outstanding natural character and may not be appropriate to transfer to the Manawatu River,

¹² An Order aims to recognise the outstanding amenity or intrinsic values that water provides, in either a natural or modified state. Orders may be applied over rivers, lakes, streams, ponds, wetlands, or aquifers, and can cover freshwater or geothermal water. If granted by the Minister, a Water Conservation Order can restrict or prohibit water 'takes', discharges and other uses of the water.

although I do note that the value used by Dr Marsh is for a tributary moving from 'not satisfactory' to 'poor'.

- 64 A further complication is that the study in the Hurunui focuses on the WTA to avoid a deterioration in water quality, whereas my understanding is that the objectives in the POP contemplate an *improvement* in water quality in the Manawatu-Wanganui region. I understand from Dr Ledgard and Dr Scarsbrook's rebuttal statements that Mr Willis' proposal when modelled shows water quality improvements. This suggests that the question that would need to be asked in any WTP/WTA study in the Manawatu-Wanganui region would be quite different to that in the Hurunui example.
- 65 Research into the validity of benefit transfer in New Zealand was carried out by Kerr and Sharp (2003)¹³ who undertook choice modelling of two Auckland streams. This involved identical stated preference studies in two separate analogous settings which yielded quite different WTP results, presumably because other variables like tastes or proximity to substitutes could not be properly specified in the model. They tested errors associated with direct benefit transfer validity and concluded:
- High benefit transfer error rates are consistent with evidence available from published benefit transfer studies ... and counsel against indiscriminate benefits transfer.*
- 66 Pearce & Howarth (2000)¹⁴ state that successful benefits transfer requires:
- 66.1 adequate data for those studies included in the analysis;
 - 66.2 sound economic and statistical technique;
 - 66.3 studies with regressions of WTP on determining variables;
 - 66.4 similar populations in the compared sites;
 - 66.5 similarity of the environmental good to be valued;
 - 66.6 similar sites; and
 - 66.7 similar distributions of property rights.
- 67 Without access to the Hurunui study's methodology (see section below on preliminary results), I cannot comment on the first three

¹³ Kerr, G., & Sharp, B. (2003). Transfer of Choice Model Benefits: A Case Study of Stream Mitigation. Occasional Paper No. 4.

¹⁴ Pearce, D. W., and Howarth, A. (2000). *Technical Report on Methodology: Cost Benefit Analysis and Policy Responses*, RIVM report 481505020

criteria, but have no reason to doubt the robustness of the methodology followed by Dr Marsh.

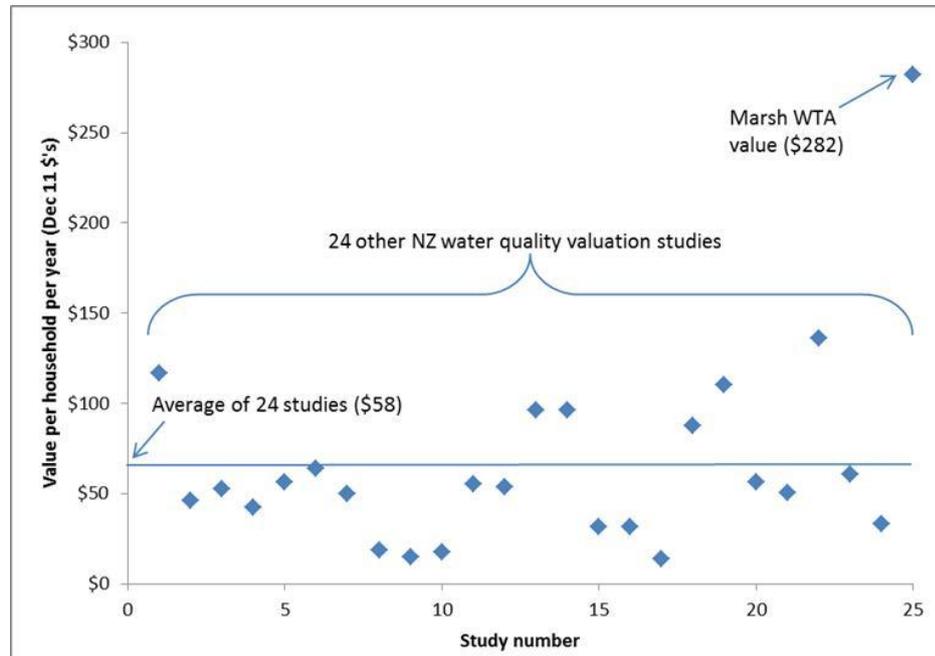
- 68 However, it is questionable whether criteria 4, 5, 6 and 7 are present in the transfer from the Hurunui to the Manawatu.
- 69 In summary, the rudimentary benefit transfer approach used by Dr Marsh is subject to criticism that casts doubts over its validity. It was agreed by all parties at Technical Conferencing that "*having Manawatu-Wanganui specific studies would enable more accurate estimation of the benefits of improved water quality*".¹⁵

Estimate used is considerably higher than in previous New Zealand studies

- 70 Using the economic values from previous studies as referenced in Dr Marsh's evidence, it can be seen that the value that Marsh has chosen is extremely high.
- 71 Figure 1 presents values from 24 previous New Zealand non-market valuation studies. The average of these previous studies is \$58 per household per annum; Dr Marsh uses \$282 per household per annum.
- 72 This does not seem to align with Dr Marsh's paragraph 80, which suggests that "*the willingness to pay for water quality improvements in the MRC region is likely to be significant **and of a similar magnitude to the studies referred to above***" [emphasis added].

¹⁵ Topic 4, 'Costs and Benefits of each regime' in the Technical Conferencing Statement.

Figure 1 Comparison of previous research and Dr Marsh's estimate



Source: NZIER

- 73 Much of this difference is down to Dr Marsh's decision to use a WTA estimate instead of a WTP estimate (all previous studies in New Zealand appear to have been based on WTP, which is in itself raises questions as to the appropriateness of its use).
- 74 But the fact that the Dr Marsh's estimate is so much of an outlier relative to other New Zealand estimates of the benefits of water quality improvements must raise questions over its validity as a value to be used for benefit transfer.
- 75 At minimum, I would have expected Dr Marsh to have provided a comparison of his estimate with overseas WTA figures to see if it falls within reasonably expected bounds.
- 76 There appears to have been no attempt to use the largest international online database of non-market valuation studies. The Environmental Valuation Reference Inventory (EVRI, www.evir.ca) is a searchable storehouse of empirical studies on the economic value of environmental benefits and human health effects. It has been developed as a tool to help policy analysts use the benefits transfer approach.
- 77 Dr Marsh has relied on the Sharp & Kerr (2005) paper combined with a search of Lincoln University's valuation database. This has limited the scope of values as Dr Marsh does not appear to have conducted a search of existing WTA studies.

Preliminary results only

78 For a decision as important as the one under consideration in these proceedings, it would seem sensible for preference to be given to peer reviewed, published estimates of the benefits of water quality improvements. As I have noted earlier, I also consider that it would be necessary to use actual data collected within the region to gain reliable information.

79 Dr Marsh explains (paragraph 100) that the Hurunui study is among the first of its kind (“our survey provides new information (for New Zealand)”) and the \$282 is one of its “preliminary results”.

80 I note that – as far as I am aware – the study is currently unpublished and has not been subjected to peer review.

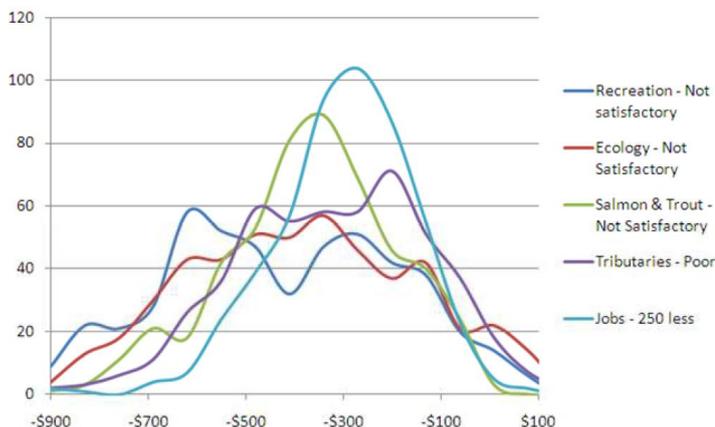
The presence of job losses significantly affects the potential benefits

81 Dr Marsh’s benefit transfer approach seems to ignore the impact of job losses despite strong references to respondents’ preferences. Paragraph 75 of his evidence states, in relation to a WTP study of the Karapiro catchment:

*“... households had strong preferences to avoid job losses in dairying; for example, **median willingness to pay for Policy 1 would be reduced to zero if accompanied by 5% job losses.**”* (emphasis added)

82 Figure 2 (paragraph 102) presents more information on the impact of job losses on WTA. However, the median value of WTA when job losses are involved is not provided by Dr Marsh. It is difficult to estimate from looking at the chart alone what the WTA figure would be with some job losses. And without access to the unpublished paper from which this chart is taken, we have no way of knowing what question was asked and what the results were.

Figure 2 WTA when job losses are present



Source: Marsh EIC Figure 2, p31

- 83 The key point here is that WTP/WTA estimates (and hence the stated benefits of improved water quality) appear to be significantly reduced if job losses occur as a result of the measures taken to achieve this improvement.
- 84 Dr Marsh argues that any loss in dairy employment “*may well be offset by an increase in jobs associated with angling and kayaking, for example*” (paragraph 76). However, there is no indication of how many people currently work in these industries in the Manawatu-Wanganui region, relative to the 2,620 directly employed in the dairy sector. And while there may be an increase in angling and kayaking activity in the region if water quality improves, it is not obvious that this would require a lot more formal employment, since most anglers and kayakers would presumably own their own equipment.
- 85 Dr Marsh also argues that including the preferences of households to avoid job losses in the cost-benefit analysis would be double counting (paragraph 76) since it would already have been accounted for in the losses of farmers’ profits. However, if we accept that society places a value on having its citizens employed, then they will presumably suffer a loss in consumer surplus (i.e. well-being) from job losses associated with regulations to improve water quality.
- 86 So if there are job losses as a result of regulation in the Manawatu-Wanganui to improve water quality – and I would contend that this is entirely possible in the short term given the discussion above regarding the displacement of intensive dairy to other regions – then households’ preferences for improved water quality could be much lower than the \$282 used by Dr Marsh.

EVIDENCE OF PHILLIP HARRY PERCY FOR ANDREW DAY

Nitrogen trading

- 87 Mr Percy develops in his EIC a proposal for N-trading at the water management subzone level as a tool for reducing the cost of N reduction.
- 88 As noted in my EIC, and agreed by economists at technical conferencing¹⁶, if appropriately designed, N-trading can be a valuable way of improving the efficiency of achieving the desired N-loss outcomes.
- 89 Mr Percy’s proposal would allocate Nitrogen to each land use based on LUC limits. Trading could then occur between land uses within

¹⁶ Topic 7, ‘Costs and Benefits of each regime’ in the Technical Conferencing Statement.

each subzone, with the consenting process being used to record any transactions. There would be no centralised market coordination or monitoring institution.

- 90 In theory, Mr Percy's proposal should provide some benefits in terms of reducing the costs of N-reduction. However, the proposed scheme raises some questions in terms of its practicality:
- 90.1 Are there likely to be many trading opportunities within WMZs? The efficiency gains from N-trading would likely be much higher if trading across WMZs were incorporated.
 - 90.2 Without a centralised institution to record market prices, bids and offers, will farmers have enough information available to them to enter into an informed trading negotiation?
 - 90.3 Will the presence of multiple N prices at any one time in multiple WMZs be confusing for farmers?
 - 90.4 Is the LUC limit allocation approach preferable to one that involves grand parenting to take into account the specifics of each farm and its historical production outcomes?
- 91 I understand that the planning evidence and legal submissions will address the late inclusion of an N-trading regime in appellants' proposals in more detail. I would just reiterate my earlier EIC that this N-trading proposal is a major initiative that warrants much more detailed analysis before its effectiveness and efficiency in practice can be assessed.

EVIDENCE OF HELEN MARR FOR FISH & GAME AND THE MINISTER OF CONSERVATION

Section 32 analysis of the nitrogen limit options

- 92 Ms Marr presents in her EIC sections 2.3.4.1 and 2.3.4.2 a qualitative assessment of the costs and benefits of the options proposed to address water quality concerns.
- 93 She concludes that the Fish & Game and the Council regimes will have higher benefit/cost ratios than the Fonterra or Federated Farmers regimes.
- 94 I note that I did not agree to any ranking of the benefit/cost ratios at technical conferencing. Without figures on the costs and benefits of the Fonterra and Federated Farmers regimes, it is simply not possible to make any conclusion about the ratio between these figures.
- 95 If the benefit/cost ratio cannot be calculated for two out of the four options, it is inappropriate to say that any of the options is

preferable to all of the others. In other words, there is no justification for Ms Marr's ranking of benefit/cost ratios.

CONCLUSIONS

- 96 There remains considerable uncertainty about the costs and – especially – the benefits of regulatory options to address water quality concerns in the Manawatu-Wanganui region. In my view, further work is required to ensure the benefits associated with improved water quality are not less than the costs of the regulation required to achieve such amelioration.
- 97 Given that we are dealing with a long term issue here, it would seem prudent to reflect the scientific and economic uncertainties present in the discussion to date in the decision about how best to proceed.
- 98 In my view until clearer evidence about the likely costs and benefits is gathered over time, this points to the desirability of a regulatory approach that seeks to achieve N-loss reductions where they can be achieved at low cost.
- 99 If this evidence indicates that water quality is not improving and that the benefits of a harder-nosed regulatory approach would outweigh the costs, then adjustments to policy settings could be made at that time.

John Stacey Ballingall

18 April 2012