BEFORE THE ENVIRONMENT COURT

In the matter of	appeals under clause 14 of 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	**MERIDIAN ENERGY LTD (ENV-2010-WLG-000149)**
and	**MINISTER OF CONSERVATION (ENV-2010-WLG-000150)**
and	**PROPERTY RIGHTS IN NEW ZEALAND (ENV-2010-WLG-000152)**
and	**HORTICULTURE NEW ZEALAND (ENV-2010-WLG-000155)**
and	**WELLINGTON FISH & GAME COUNCIL (ENV-2010-WLG-000157)**
	Appellants
and	**MANAWATU-WANGANUI REGIONAL COUNCIL**
	Respondent

STATEMENT OF REBUTTAL EVIDENCE FOR GARTH OLIVER EYLES

1. INTRODUCTION

1.1. My full name is Garth Oliver Eyles. I have the qualifications and experience set out in my evidence dated 17 February 2012.

1.2. I attended expert Conferencing on 9th March. A record of that conference has been provided to the Court in the form of a conferencing statement.

2. PURPOSE AND SCOPE OF EVIDENCE

2.1. I have read the evidence in chief of Dr McConchie and respond in this evidence to some matters raised by Dr McConchie.

2.2. I have read the evidence in chief of Mr. Andrew John Barber, and in this evidence I comment on Mr. Barber's views as to the appropriateness of the Horticulture Code of Practice as a performance standard.

3. EXPERT WITNESS CODE OF CONDUCT

3.1. I have been provided with the Code of Conduct for Expert Witnesses contained in the Environment Court's Consolidated Practice Note 2011. I have read and agree to comply with that code. This evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

4. DR McCONCHIE'S EVIDENCE.

4.1. The Specific Issues raised by Dr McConchie in his Executive Summary appear to be based on a series of 'facts' and interpretations which lead him to conclude that "the policies and regulations in the One Plan, as they relate to hill country farm management are unfounded and unwarranted." From my experience in the area I have concerns about information has been used to reach this conclusion, and I do not agree with it.

4.2. Storm events have occurred in the past and will continue to occur in the future. Changes in land use from forest to pasture have increased the risk of erosion and that soil conservation measures are needed to minimise these risks. Reducing the erosion in the hills reduces the problems on the plains. The community needs to minimise the risks to these plains now and in the future. Specific areas of hill country are more erodible than others and, therefore, need more specific management programmes to protect their soils and to protect the off-site effects, especially the in-stream effects. Sediment in streams has a negative effect on the biological life and on stream bank erosion.

4.3. At paragraph 13 c) Dr McConchie states that “Realistic predictive mathematical analyses of slope stability cannot be carried out for natural slopes. This is because stability is controlled by the presence of “imperfections” in slope materials. Predictive models are usually only relevant for artificial slopes where the properties are known and can be engineered to behave in a particular manner.” Yet in his paragraph 109 Dr McConchie advocates the establishment of a robust slope stability model and again in paragraph 113 a model of potentially unstable areas. For the reasons given by Dr McConchie, I consider this would be a hugely difficult and expensive task as hill country is highly variable in terms of rock type, soil depth, soil structure and slope.

4.4. As explained in my evidence-in-chief, the Land Use Capability mapping system identifies the important physical attributes relating to sustainable land use, and presents these in map form as inventory map units from which Land Use Capability units are identified according to a regional classification. In modern parlance this could be described as a model and it has stood the test of time. Rather than creating a new model I believe a very similar result can be obtained by using the LUC ‘model’, and that is the approach which should be adopted here.

Regional situation

4.5. Dr McConchie's evidence concentrates on landslide erosion. Landslide erosion is one of the groups of erosion types occurring in the region.Earthflow and gully erosion are also significant. While landslide erosion is the most obvious during a major storm event, earthflow and gully erosion both also provide significant discharges of sediment to waterways, severely effect farm infrastructure and reduce long term pastoral productivity. These erosion types have been taken into account via the LUC classification used in the preparation of the HEL classification.

4.6. In paragraphs 32, 33 and 34 Dr McConchie places emphasis on distinguishing between natural and accelerated erosion. He states the "natural level of erosion needs to be known and clearly defined if human impacts are to be placed in context." For many years now Land Management Officers (LMOs) have deliberately avoided becoming involved in arguments about what is natural and what is accelerated erosion. This attempted distinction is an old and outdated concept. LMOs are concerned with identifying 'present' erosion and its severity, assessing the risk of future erosion and addressing how to best minimise this risk. Areas with high rates of 'natural' erosion also generally have high rates of 'present' erosion and a high potential for 'future' erosion.

4.7. The task of LMOs is to reduce the probability of this potential being achieved by applying appropriate erosion control measures. However, they all accept that occasionally there will be a storm of sufficient magnitude that it will overwhelm some of these control measures. When undertaking a LUC assessment of a property, a LMO maps the erosion that is visible as part of preparing the resource inventory. That erosion is recorded as present erosion, regardless of its origin.

4.8. In paragraphs 34 and 35 Dr McConchie contends that the dichotomy of natural versus accelerated erosion leads to unjustified faith being placed on catchment re-vegetation and restoration. He states *"If the dichotomy of 'natural' versus 'accelerated' and 'initiated' is accepted categorically, the maxims 'what humans* *have initiated humans can stop' and 'what humans have accelerated humans can control' tend to promote compelling and perhaps unattainable objectives. These in turn can put a degree of unjustified faith in catchment re-vegetation and restoration as a means of obtaining slope stability. It is not uncommon to read statements such as "A tree covered landscape is required if stability is to be achieved on North Island mudstone hills".*

4.9. I agree with that conclusion and also note that Dr McConchie was the second author of the paper (Crozier et al., 1982) from which the statement is taken. It has been the experience of generations of LMOs (including my own) that trees are essential aides to stabilising our hill country. However, we all understand trees will not totally prevent soil erosion during extreme events.

Philosophical frameworks

4.10. In paragraph 36 Dr McConchie argues that the Proposed One Plan statement that *"there has been a significant reduction in productive capability of land; high sediment loads in waterways and land stability hazard etc."* is demonstratively incorrect (in the upper Whanganui catchment at least). I disagree. The upper Whanganui catchment is no different to other parts of the region in exhibiting the effects of soil erosion on productivity. Studies have shown conclusively that the production on a slipped surface rises slowly from zero immediately following a slip event to not more than 80% of the uneroded surface over time (e.g., Rosser, 2011, DeRose, 1995,) Dymond (2006) has shown that forest reduces the risk of erosion by 90% when compared to pasture.

4.11. Increases in hill country productivity over time have occurred due to improved pasture and stock management and higher grazing intensities, despite the loss of significant areas of soil from erosion. In section 4.12 of this evidence I discuss the effects of large storm events on soil loss. Each storm event results in less productive soil remaining on slopes. This in turn results in increased pressure on the land to maintain stocking rates. At some stage I believe production will start to decrease unless soil conservation measures are in place.

The 2004 multi occurrence landslip event

4.12. Dr McConchie emphasises in this section of his evidence (see paragraph 84) that during the 2004 storm *"the area affected by landslipping averaged only 5%. That is 95 % of the area remained stable. Even in the small areas that were worst affected only 20-35 % of the ground was disturbed. Therefore, even in these areas 65-80% of the ground remained unaffected."* The implication Mr. McConchie is making is that these areas are stable.

4.13. I do not agree with the contention that 95% remains stable. In the past there have been storm events which also caused extensive erosion, e.g., Cyclone Alison (1965), Cyclone Bola (1988), Cyclone Hilda (1990), and the 1992 wet winter events to name just four. These storms did not cause previously stable land to suddenly become unstable. In each storm, according to Dr McConchie's argument, the material that did not slip was 'stable' at that time but somehow became 'unstable' prior to the next storm. This contention is inconsistent with the comment in his paragraph 45 of Dr McConchie's evidence, where he states "many slopes are preconditioned for landsliding and require only a small change in one factor to trigger failure." In other words these slopes are 'unstable'.

4.14. I believe a more accurate description is that 95% of the hill country remains unstable, and is ready for erosion to be triggered by future storm events unless strong preventative measures are undertaken.

4.15. If an average of 5% of land loss occurred in each major storm during the last 50 years, 25% of catchments would have eroded and, in the worst catchments, 125 to 150 % would have eroded. Storms prior to 1965 have not been taken into account.

4.16. If this is the case, for the reasons I have given in my evidence-in-chief, I consider that it is very important the remaining soil be retained. The region's prosperity depends on production from these remnant soils.

Context of soil slipping

4.17. In paragraph 37 Dr McConchie implies that the present Waipawa erosion period is of a lower magnitude than three of the previous periods, leading to his conclusion that the landscape is becoming more stable. However, I believe this is incorrect, as the present period is still occurring and, therefore, no assessment of its magnitude can be made.

4.18. In “Hawke’s Bay Forests of Yesterday” Grant (1986), the author comments that about every 350 years a major event has occurred which has devastated forests and initiated erosion. We do not appear had one of these major events in the period since forest clearance but we have had four major regional events; 1897, 1938 (Anzac storm), 1988 (Cyclone Bola) and 2004. In between, there have been more localised events devastating small areas of hill country.

4.19. In paragraph 51 Dr McConchie states *“…more extreme and therefore rarer events are now required to trigger landslips than in the past.”* I agree this possibly be the case if soils were becoming shallower evenly over slopes. When a face fails, generally only part of the face slips, the whole face does not slip. The soils on the uneroded slopes (face) exist beside the new, very shallow, skeletal soils on the slipped site. Thus across a typical hill country slope there is a mosaic of ‘mature’ and ‘recent’ soils of varying age and depth and degree of maturity. Until these non eroded soils have all eroded, I believe they are susceptible to the same trigger points as before and, in some cases, lower trigger points, as the adjacent new soil surfaces are thinner, leaving a weak zone around the margins. In my experience a ‘more extreme’ trigger is not needed. In 1992, for instance, there was such a wet winter in the Manawatu landslides occurred during minor showers due to the soils saturation levels.

4.20. Because a slope or part of a slope has not slipped does not necessarily mean it is stable; It just means it has not slipped yet! If these slopes were stable there would be no erosion on land which has been afforested after the first storm event following forest clearance. However, this is not the case. (Dymond, 2006.)

4.21. In paragraph 84 Dr McConchie emphasises the 2004 storm was an extreme event with a return period of at least 1:150 years. Return periods are normally developed for flood prediction and not soil erosion prediction and are estimates only. Frequently, two storms with similar return periods occur in one year. The factor controlling slipping once the regolith is saturated is most likely the intensity of rainfall, within a storm event this depends on the direction from which the rain falls and where particular rainfall cells within the main event are located. The 2004 storm was probably no different to Cyclone Bola (1988) or previous regional storm events which caused severe erosion.

4.22. Erosion causing events are of many forms. The 1992 event in the Manawatu, comprising a very wet winter with continual cloud, caused significant erosion but no major flood. While the 2004 event was 'extreme' Dr McConchie has not identified the trigger rainfall that initiates significant erosion. It is probable the rainfall was well in excess of triggering rainfall. It is likely a 1:100 year regional storm could have resulted in significant erosion but this may not be considered an extreme event as it may not cause extreme flooding.

4.23. In paragraph 13q Dr McConchie contends that increased stability results from increased slipping in hill country. From my experience in the Manawatu-Whanganui region the only environment where this could apply would be on the hard sandstones and the cemented ignimbrites, both relatively uncommon rock types when assessed regionally.

4.24. On most of the hill country in the region the underlying rock type is sufficiently soft that when exposed by a slip it weathers rapidly, and a new soil forms and a grass cover is achieved within two or more years on many sites (depending on how summer dry the sites are). These soils are very shallow and drought prone, but develop rapidly as the underlying soft rock weathers and the vegetation roots penetrate. This means that in a relatively short time the sites can and do erode again. An example is the Pohangina hill country where I have seen 'families' of slips moving up a previously eroded surface. Thus, on these slopes the slips both occur in the uneroded soils and in the new shallow soils. The debris resulting from these is less than the initial erosion but the soil loss means grass production is reduced.

Hill country management areas

4.25. In paragraph 60 Dr McConchie identifies increased productivity has occurred in HEMA areas, inferring erosion cannot be a problem. As I have said, in paragraph 2.7, slip rehabilitation trials have shown conclusively that eroded slips do not produce above about 80% of the pre eroded site. Thus, there is a permanent productivity loss of a minimum of 20% long term on each erosion scar. In some cases, this loss has been compensated for by increased fertiliser use and improved stock management. Grassed slip scars have shallow soils and are more susceptible to drought. These old slips are the first to dry off and the last to green up. As Dymond (2006) in *Geomorphology* states, repeated landsliding is gradually decreasing the pastoral productivity of hill country jeopardising the sustainability of hill country farming. Soil erosion lowers the long term productive potential of the area and therefore its sustainability. Activities that raise the trigger point above which soil erosion occurs are therefore important considerations for the economic future of the region.

Implications

4.26. In paragraph 111 Dr McConchie states *"an erosion management model based on a single slope or the land unit approach of the LUC for the entire region is inappropriate. It casts an unreasonable, overly conservative and unjustifiable 'net' over the landscape."* The reasons he gives for this statement in the submission indicate a major lack of understanding of the LUC system. In my view, Dr McConchie has attempted to discredit the system with erroneous arguments about natural vs. accelerated erosion (paragraph 33), overly simplistic mapping of erosion (paragraph 69), and using the term LUC class (*identifies general level of capability*) instead of LUC unit (*the management level of the classification*) (paragraph 13mm). He then proposes a model be developed.

4.27. This model (paragraphs 13gg, 13hh, 71, 109,113) has yet to be developed, field tested and applied regionally. To be effective it would need to operate at the paddock level in a very complex physical environment and also be applicable regionally. These complexities are why this has not been undertaken successfully in the past and this is why the LUC system has been successful - it is based on map units (or management units) and not individual slopes.

4.28. I disagree with Dr McConchie’s proposal. The LUC classification system has been tried and tested nationally and is used for all farm planning by the Regional Council. I do not believe it should be discarded in this region for a yet to be developed system which, even if it can be developed, is untried and untested.

Conclusion

4.29. The Manawatu Whanganui region is physically a very complex environment with a mosaic of different erosion types and potential erosion severities. Dr McConchie’s position appears to be based around ‘the more erosion there is in hill country the more stable the environment becomes’. I find this an interesting and unusual approach. In the predominantly soft rock and very complex environments that occur in the Manawatu Whanganui Regional Council area I have not seen any reduction in erosion during the storm events I have witnessed since the 1960s. Dr McConchie may be correct in specific hard rock environments when assessing very long term periods, but, as we are working in this particular region, and in the present and the foreseeable future, I do not agree with his position.

4.30. I believe that it is critical that the rules developed for use by landowners are straightforward to interpret and practical to implement. This means continuing to use the LUC system as a basis for straightforward, practical planning as it has been the basis of soil conservation planning in the region for 50 years.

5. MR. BARBER’S EVIDENCE

5.1 In paragraph 15 Mr Barber sets out his thesis that "*the best approach for affecting change is to get recognition of the problem, then cooperatively develop a solution, and then disseminate that information and allow sufficient time for the practices to be implemented before finally following up with enforcement where changes are not occurring*." He then provides the means by which this can be adopted in the Council area. I agree that this is often an effective approach but it has risks, the main ones being the time taken to set up the programmes and the need for long term monitoring and enforcement.

5.2 Cultivated land has the potential to provide both excess nutrient and excess sediment loadings to waterways during runoff events, which can adversely affect the values of the waterway. Adoption of best management practices, including precautionary riparian setback distances, along with in stream receiving water quality standards, within a regulatory framework, is important to ensure that activities are undertaken in a manner which protects the health of waterways. This approach ensures risk is minimised through the requirement to meet minimum standards, which should be backed up by monitoring and enforcement to ensure compliance. In my experience best management practices are an excellent concept but on their own their long term effective application is difficult, and they may not achieve the necessary off site results needed by the community.

5.3 Mr Barber then goes on to discuss the Code of Practice for Commercial Vegetable Growing in the Horizons Region, stating under paragraph 24 that "*this still stands as the best approach for minimising soil erosion and sediment loss*". While I support the development of industry codes of practice I believe that these codes, in regards to sediment/ nutrient and erosion control, need to be supported by quantitative evidence that the practices will result in minimal sediment/nutrient generation and water quality change.

5.4 Under section 30 of Mr Barbers evidence he discusses the Horowhenua sediment loss trial stating that "*Very little evidence of soil erosion was found; which is consistent with what most believe, that there is very few erosion problems associated with cultivated horticulture in the Horizons Region".* Little information is provided on the research design and robustness. Presuming the scientific method was robust, there is still no logic to that statement as local trial results cannot be extrapolated to the region, which comprise varying soil characteristics for eg the pumice terraces around Taumaranui and the ashes around Ohakune (which have a sufficient problem to warrant their own guidelines).

5.5 In regards to the Code of Practice for Commercial Vegetable Growing in the Horizons Region there is a noticeable lack of quantitative information regarding the likely performance standard discharges. This makes me very concerned about basing a set of rules upon a Code of Practice which is not supported by fact, and which fails to provide some form of measurable target to provide a feedback loop if there are significant effects on receiving water as a result of discharges from the activity. As stated by Mr Barber in the conferencing statement "*There has been no research linking cultivation best management practices, in the Horizons Region, and water quality*".

5.6 Mr Barber then goes on to state under paragraph 30 that "*We observed one instance of soil being captured by a silt fence after an overland flow path through cultivated found. This type of overland flow path will most likely only carry water in significant rain events*". It appears that there is an implied acceptance that it is not the responsibility of the manager to control runoff from the site during rain events. It is my position that it is in fact the responsibility of the manager to control the discharge of sediment from the work site, hence the application of sediment and erosion control measures. It is imperative that the design standards for runoff controls are for at least a 5 year event and preferably a 10 year event.

5.7 I have the following comments on the proposed use of the Code of Practice for Commercial Vegetable Growing in the Horizons region provided in Appendix 1 of Mr Barbers evidence:

- The Code has been developed to encourage best management practice for vegetable growers. I understand vegetable growing comprises only a very small area of the total cropped land in the region and that rule 12-3 encompasses all cultivation activities currently. Therefore, if the rule referred to the Code, this Code would apply to all cropped land.

- The techniques in the Code do not appear to be designed to protect from a particular sized event. In my opinion this is essential if they are to be effective.

- Monitoring and policing of the vegetable growers is not discussed in the Code of Practice document. Without the inclusion of monitoring and policing I do not support the Code's inclusion.

- The Code is not based on factual information. Demonstrations of best management techniques have been used in the Horowhenua area but these have not provided quantitative values of their effectiveness. I do not support a code that is not underpinned by quantitative data that supports the use of the techniques.

- There is a separate set of guidelines 'Better Management Practice Guidelines' developed by the Ohakune Vegetable Growers Association, with the support of horizons.mw and the New Zealand Vegetable Growers Federation (Vegfed). There is no indication as to who monitors or enforces this set of guidelines. There is also no indication as to which set of guidelines would take precedence in the Ohakune area.

Conclusion

5.8 Because of the high risk of nutrient and sediment pollution of waterways from cultivating/cropping land activities, I do not believe that the Code of Practice for Commercial Vegetable Growing in its present form provides enough surety to be sufficient on its own. Its development is a very positive move but it needs more quantitative research.

5.9 The croppable landforms in the region are variable, they range from highly wind and water erodible pumice terraces, mainly in the upper Whanganui catchment, Andesitic tephra soils mainly around the ring plain of Mt Ruapehu, loessial soils on the downs and alluvial soils on the plains and in the valleys. Each of these environments has particular on-site limitations and off-site effects requiring particular management systems to minimise risk while maximising productivity. I believe it would be very difficult to have a Code of Practice which covered all the requirements of these environments. However, I believe it is a goal worth striving for.

5.10 In my opinion, the techniques advocated in the Code are appropriate, but until the Code has been expanded to cover the needs of the range of crops grown in the region on the range of environments, and has proven that it is successful in reducing off-site effects to an acceptable level, rules which establish appropriate riparian setback distances, and measurable and defendable instream receiving water quality standards still need to be included in the Proposed One Plan.

Garth Oliver Eyles

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