BEFORE THE ENVIRONMENT COURT

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	**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 TECHNICAL EVIDENCE BY ALLAN NORMAN KIRK ON THE TOPIC OF SUSTAINABLE LAND USE AND ACCELERATED EROSION ON BEHALF OF MANAWATU-WANGANUI REGIONAL COUNCIL

Dated: 31st January 2012

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MY QUALIFICATIONS / EXPERIENCE

1. My full name is Allan Norman Kirk. I have a Bachelor of Agriculture Economics degree from Massey University and a Post Graduate Diploma in Education. I have been employed by Horizons Regional Council for 18 years and am currently the Environmental Coordinator (Whanganui Catchment Strategy) based in Wanganui.

2. I have read the Environment Court's practice note 'Expert Witnesses – Code of Conduct' and agree to comply with it.

ACCELERATED EROSION

3. The Horizon's Region can be divided into five major physiographic zones allowing the categorisation and defining of generalized issues in relation to the interaction between existing land use and intergenerational protection of the Region's soils.

4. The dominant zone is hill country. This zone covers almost two thirds of Horizon's region and includes approximately 274,000 hectares of soils with a potential for moderate to severe risk of erosion. The zone is characterised by moderately steep to very steep heavily dissected hill soils with entrenched hydrology systems and associated narrow flood plains. The dominant limitation to long term intergenerational use of the soils in this zone is accelerated erosion.

5. The Hill Country is dominated by tertiary aged rocks weathering to produce soils with varying sized sediments. These sediments are defined by a field inspection of their rock particle size divided into either mudstone, silt stone, or sandstone suites as defined in the Land Use Capability Classification (LUC). Once defined, correlations for each particle size can be determined with their soil types, inherent fertility or nutrient status, potential and actual erosion types, drainage classes and physiography for each.

6. Additional Hill Country in the Horizons Region is mantled with loess or andesitic tephra that differentiates their soils but still allows for similar correlations that align it with their soil types, inherent fertility or nutrient status, potential and actual erosion types, drainage classes and physiography for each.

7. These correlations are inherent factors contributing in varying degrees to erosion on any individual site. Soil type for example, can be further differentiated to include its thickness, moisture conditions, land use and management. Nutrient status can be an indication of the, management, or vegetation and its rooting depth. Erosion can be delineated to include actual, past, processes and potential. Physiography includes geology/rock type, aspect, topography, elevation, hydrological influences, hydrology, slope form, and slope angle.

8. In addition, these correlations combine with climatic conditions and geological processes to initiate slope failure or erosion. This includes erosion events such as sheet, soil slip, flows, gully, tunnel gully, and deposition. There is therefore a wide range of inherent and external factors that contribute to determining any given slope's propensity to erosion events.

9. The Hill Country soils have all been developed under a forest cover. The subsequent removal of the forest cover has limited the ability of the soils to withstand climatic events such as the storm event of 2004. These cleared soils are more susceptible to accelerated erosion.

10. Many soils due specifically to the inherent fertility of the rock type from which the soil was formed from, are susceptible to regrowth of woody vegetation. This colonizing woody vegetation has some soil holding attributes. These attributes change over time, becoming more pronounced with older and canopied vegetation necessitating consideration of their soil conservation value.

11. If allowed to develop the next stage of succession in woody vegetation establishment will allow for biodiversity values to be incorporated into the consent process.

VEGETATION CLEARANCE

12. Initiation of field inspections to determine the susceptibility of slopes to soil erosion events coincides with the landowners desire to undertake land use activities such as vegetation clearance. The inspection is always initiated by the landowner who determines a degree of risk or the potential to trigger the current two hectare rule. The degree of risk is difficult to determine based on the wide range of contributing factors previously outlined, so the two hectare trigger is an easily determined threshold.

13. Small areas of vegetation clearance are rare. The dominant and only infield vegetation clearance consents have been for the clearance of 'scrub' or *Leptospermum ericoides* and *scoparium*. Scrub thrives on low fertility HC LUCC V, VI, VII. These hill soils are characterised by long slopes and by slope angles greater than 25 degrees. The slopes are always well in excess of two hectares. In addition, the economics of this type of vegetation is that 8-12 year cycles of clearance are usual. After eight years, a significant area of the slope is covered with scrub that then makes the spraying or cutting a viable operation in terms of economies of scale.

14. A clear and easy to determine indicator such as the two hectare or slope angle allows the landowner to initiate a meeting with a Horizon's Land Management Officer (LMO). The LMO can then take into consideration other relevant factors that may contribute equally as significantly as slope angle to the potential for slope failure associated with vegetation clearance or earth disturbance activities.

15. Geological erosion events, in particular slumps, follow the same correlations in varying amounts but are strongly influenced by geological processes. In addition the link to climatic influences is tenuous both in initiating or accelerating slump erosion. The link or correlation with slope angle is limited, more importantly in slump erosion is the lithology and stratigraphy of the area. This requires specialist input to determine issues and remedies. These events are generally well known due to their size, and their ongoing effects on physical and natural infrastructure.

HILL COUNTRY CULTIVATION

16. Recent Hill Country cropping has been initiated by aerial application of herbicides on soils previously believed to be too steep or uneconomic for cultivation. However a modern approach has been developed along the line of the following: firstly allow for an aerial application of a chemical such as glyphosate which eliminates all vegetative cover including grasses, this would occur in the early spring period from August to September. This will be followed three to six weeks later with a summer fodder crop. This crop would be grazed off and in early autumn a high yielding rye clover mix would be sown as a new grass crop.

17. This management tool for Hill Country cropping is a recent innovation and is reflective of low chemical and application costs. It poses a potentially significant risk to Hill Country soils due to de-vegetation and long term viability or persistence of existing high yielding grasses and clovers.

18. This will lead to high sediment losses and eventually loss of any potential productive use of our Hill Country soils.

19. This type of cultivation needs to be covered in a way similar to cultivation on slopes under 20 degrees that is included in the next section of this report. In addition, due to the extreme potential for accelerated erosion under these cultivation techniques on Hill Country soils control over timing, and techniques associated with particular soil types to minimize soil loss and sediment, movement needs to be included in any consent for this activity.

ADDITIONAL ZONES

20. The other main zones include the coastal sand zone which has been agreed.

21. The remaining zones include the marine terraces immediately inland of the coastal sand zone. This zone is interspersed with smaller areas of alluvial terraces associated with the main rivers (Whanganui, Turakina, Rangitikei and Manawatu). The last or Mountain zone includes the Tongariro andesite

volcanoes and their ring plains, plus the mountain ranges of Hauhungaroa, Kaimanawa and Ruahines.

22. Marine terraces, alluvial terraces and the mountain's ring plains have slight potential for accelerated erosion. However, some soils under cultivation have the potential for moderate levels of wind erosion and accelerated erosion due to fluvial effects on exposed soils.

23. Most of these cultivatable soils (if not all) have been established from a base rock that was established from eolian and or fluvial actions. Once exposed and cultivated these soils lose their organic materials and structure which are the cohesive factors that bind and prevent accelerated erosion. This loss of their cohesive factors due to cultivation will result in these soils again become susceptible to eolian or fluvial actions creating soil loss and sediment movement.

24. Management considerations are critical in determining the timing, and techniques associated with particular soil types to minimize soil loss and sediment movement on slopes particularly under 8 degrees. Mitigation measures could include adherence to best management practices and riparian setbacks that include a maximum of 5m of retained vegetation around any waterway including some setback from all ephemeral or lower order stream.

25. Cultivatable slopes between 8-20 degrees are associated with greater risk and on eolian soils, established wind shelter and 5m riparian setbacks are imperative. On fluvial established soils a 5m riparian set back would be sufficient to reduce the sedimentation movement associated with cultivation.

26. Cultivation on slopes greater than 20 degrees has the potential for extreme or very severe soil loss and or sediment movement. Cultivation on these slopes is such that any minor weather event will lead to accelerate erosion. The effects associated with this can be reduced [to some degree] by riparian setbacks. I would advocate for the cultivation of these slopes to be covered by even greater restrictions around the timing, and techniques

associated with particular soil types to minimize soil loss and sediment movement

LAND DISTURBANCE

27. Land disturbance including new tracking on Hill Country has the potential to destabilise slopes and capture and channel water. These two factors contribute to a significant level of soil movement and accelerated erosion.

28. Disturbance of even small areas on a slope can destabilize critical areas, thereby creating escalating effects. Slopes must be considered as a whole rely and all factors relating to accelerated erosion need to considered.

29. Channeled water due to tracking or earth disturbance often poorly targeted to fragile areas of the slopes causing accelerated erosion. In other instances it is not controlled and leads to significant levels of sediment movement and soil loss. These process all lead to accelerated erosion and sedimentation of our waterways.

30. Soil disturbance on non-Hill Country has the potential to create effects similar to those on Hill Country. The potential for accelerated erosion on sand country or other similar eolian deposited soils can be extreme.

31. Soil disturbance on all soils has varying degrees of risk associated with accelerated erosion. Once a soil has been disturbed its structure and the vegetation associated with stabilizing and the cohesive factors of that soil are lost. This can result in accelerated erosion and sediment loss to water.

32. The trigger of 2500m² is not technically sound and as such should also be covered by a 25 degree threshold.

33. When determining risk associated with soil disturbance, the limiting or risk factor for the Hill Country slope angle is easiest. A slope angle can be easily determined and then translated into a measure of increased risk that is easily discernible by a landowner who can initiate contact with Horizons.

34. Erosion events reach a maximum on Hill Country with slopes between 26 and 40 degrees. While recognising many other factors are also contributing to erosion events, the increased risk associated with slope

angle is strong. In addition, slope angle is widely accepted by landowners as one of the indicators of any slope's potential for failure.

RIPARIAN VEGETATION

35. Riparian vegetation can serve a number of functions depending on wide range of factors. The development of riparian zones and the planting of riparian vegetation can serve to act as bio-filters, ecological restoration, in-stream shade and temperature control, habitat, aesthetics and organic inputs.

36. Developing a riparian vegetated area may be as simple as leaving or retaining vegetation in a 'scrub clearance' program. At the other end of the continuum it may require stock exclusion fencing and tiered planted ecological sourced indigenous flora.

37. However, many of the landowners we deal with develop and plant riparian vegetation for a variety of other practical reasons. Dependent on their personal goals and values landowners use reasons such as improved downstream water quality, flood flows, containing overland contaminant flows, reducing soil loss, bank stability, channel structure, stock management, pasture management, shelter and shade for stock, and enhanced property values.

38. Landowners develop their own reasons (or are convinced of the merits by LMO) for their riparian vegetation and its protection that sit within a practical subset of reasons. Landowners see the development of riparian zones as an evolving process of which they have ownership. This is important for the ongoing maintenance and protection of these areas but more importantly for their long term retention.

39. Riparian zones with significant biodiversity values are deemed to have ecological values and are treated as such. These areas have intergenerational benefits that are protected for their riparian function and their biodiversity value.

40. Retention is decidedly important as cattle or other feral animals (or chainsaws) can disseminate riparian vegetation in days. This dissemination can be accidental or intentional. In addition riparian vegetation is generally not visible or accessible by the public or inspectors without the cooperation of the riparian developer. Retention of riparian vegetation nearly always falls on the landowner and as such, their own reasons are an imperative to ensure retaining the wide range of tangible benefits from riparian vegetation.

41. Existing riparian vegetation in riparian zones can take many forms from pastoral grasses, exotic trees, to indigenous flora. Any vegetation becomes riparian vegetation by its mere location and then plays a significant role in achieving some of the benefits achieved by riparian vegetation. Differing retained or protected vegetation achieves differing benefits within the riparian zone and each type of vegetation has its place and role.

42. A realistic and effective riparian setback is 5m.

LAND USE CONSENTS VEGETATION CLEARANCE (IN FIELD)

43. Activities such as vegetation clearance and soil disturbance have a wide range of contributory impacts on the stability of Hill Country and the effectiveness of riparian vegetation. The contributing factors and the evidence ascribed by other experts recognising the complexity of accelerated erosion (or slope failure) on any given slope, indicate that it is a specialist role requiring specialist input to determine a slopes potential for failure or accelerated erosion associated with land use activities.

44. Consents for vegetation clearance are always initiated by landowners in response to the current threshold; the clearance of two hectares of contiguous vegetation requires a land use consent. The threshold of two hectares remains as an easily discernible determinant to initiate a more thorough inspection by the local LMO.

45. The local LMO often knows the landowner or the property for which the land clearance consent is being sought. This association is important in developing a relationship between the landowner and the LMO. Ultimately

implementation (including auditing) and monitoring of these consents is reliant on that relationship and the cooperation of landowners.

46. During an inspection the LMO develops a risk profile for the slope associated with the vegetation type, maturity, distribution and location. This, combined with the indicators for the (whole or parts of the) slope's risk factors are combined on-site to determine areas to be cleared or sprayed and exclusion (or protection) areas.

47. Exclusion areas include riparian vegetation associated with lower order and unnamed perennial and ephemeral waterways. It includes areas that would have complete reliance on the existing vegetation, slopes that have a moderate level of potential risk of failure into any waterway and any slope with a potential for severe risk of failure. Levels of potential failure are determined in line with the LUC associated with that specific slope.

48. There has not, at this stage been any ongoing discussion or lack of consensus between the local LMO and the applicant with regards the vegetation clearance consent and what constitutes the sprayed and or the exclusion areas. It has initiated greater collaboration and consultation between the farming community and LMO. This allows the development of a wide range of soil conservation techniques to be discussed and implemented by a cooperative and compliant landowner. In addition it has allowed the development of riparian zones and the protection of any vegetative cover in this area.

SUSTAINABLE LAND USE INITIATIVE (SLUI)

49. The SLUI has, and continues to be a comprehensive approach to Hill Country soil conservation. Its basis, the land use capability classification system (LUC) is a classification system that differentiates land according to physical limitations or hazards. It comprises of eight different classes of land (called LUC Class) and each is described below. The LUC Class is further subdivided into LUC Subclass according to the major limitation present. The LUC Class and Subclass are then further divided into the LUC Unit where landforms with similar properties are grouped together.

50. To take a LUC classification down to the unit level, a land resource inventory survey needs to be undertaken first. A land resource inventory survey is the field mapping of the geology or rock type, the soil type, the slope, the erosion types and severity and the vegetation type present. These five factors (rock type, soil type, slope, erosion type and severity and vegetation) are termed the land resource inventory factors.

51. The success of SLUI has been the joint efforts of ratepayers, taxpayers, Horizons Regional Council and landowners. Additional and heightened interest has been generated within the wider community, with all parties recognising it as a very powerful tool and a meaningful step forward. This combination allows landowners to realise the soil conservation work many of them have undertaken at an albeit slower pace over the years, now with community wide recognition and support. This recognition and support has added to an increased the rate and methods open to LMOs to undertake soil conservation work in the region.

52. An indication of the acceptance of the implications of LUC, is in some extreme cases, 30% of an individual property requiring retirement from pastoral farming has not been disputed. In some cases the interpretation and time frame for implementing any changes in land use may vary but the basis of the land resource inventory and the subsequent LUC are almost universally accepted. This allows for clear and sustainable decisions to be made around the intergenerational protection of our region's soils.

53. In the past, soil conservation grants followed a tightly regulated bureaucratic process that slowed and restricted the ability of the LMO to work with the landowner. The new process gives the LMO an operating budget allowing for an 'on the spot' agreement (within budgetary constraints) with the landowner. This generates a sense of partnership and energy that moves projects forward quickly. The landowner is immediately aware of Horizons contribution and has the technical support of the LMO.

54. SLUI has been running since 2006 and we have now completed 369 Whole Farm Plans. This covers 280,441 hectares or 28% of our Hill Country farmland of our region. In total 85% of the whole farm plans currently have projects underway. Milestones to date include in excess of 9,260 plus

hectares of works that have been completed, 5.17 million trees planted and 280 kilometers of fencing erected.

55. This year we continue to meet our targets, Whole Farm Plans, works completed, and to budget. There is still strong demand for plans and a commitment from landowners to undertake work programs. All of the work programs completed to date have required significant input from the landowners in their own time and in dollar contribution to the works. This year our landowners have contributed $780,000 as their share of the works cost, bringing their overall cash contribution to SLUI of $3.5 million.

ALLAN KIRK
ENVIRONMENTAL CO-ORDINATOR