BEFORE THE ENVIRONMENT COURT

Under	the Resource Management Act 1991 ("Act")
In the matter of	appeals under clause 14 of the First Schedule to the Act concerning the Proposed One Plan for the Manawatu-Wanganui Region and the topic of Biological Diversity
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-000151
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
and	**MANAWATU-WANGANUI REGIONAL COUNCIL** Respondent

Statement of Evidence in Chief of
PHILIPPE JEAN ROBERT GERBEAUX
on behalf of the Minister of Conservation and Wellington Fish & Game Council

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Dated: 17 February 2012

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STATEMENT OF EVIDENCE IN CHIEF OF PHILIPPE JEAN ROBERT GERBEAUX

QUALIFICATIONS AND EXPERIENCE

1. My full name is Philippe Jean Robert GERBEAUX.

2. I have the following qualifications: D.E.A. ("Diplôme d'Etudes Approfondies", eq. M.Sc.) in Ecology, Ethology and Planning (1982) from the University of Toulouse (France), D.E.P.T.N. ("Diplôme d'Expert en Prévention et Traitement des Nuisances"), a post graduate diploma in Prevention and Treatment of Pollution (1982) from the University of Savoie and Ph.D in Resource Management and Ecology (1989) from the University of Canterbury and Lincoln College (New Zealand).

3. I have worked in the field of wetland ecology and management for the last 28 years, in New Zealand and overseas, working both in a research and management capacity.

4. I am currently employed as a Senior Technical Support Officer by the Department of Conservation specialising in freshwater/wetland ecology and management and have been in this position since April 2009. I provide specialist advice on the management, restoration and use of freshwater and wetland ecosystems and species at national level.

5. Between 1995 and 2006, I was employed by the Department as a Technical Support Officer on the West Coast and regularly provided advice on relevant matters of wetland identification, delineation and assessment. In that position I also co-ordinated conservation, survey and monitoring programmes related to indigenous freshwater fish and fisheries. I was seconded during the last part of that period to the Research and Development Division of the Department to lead the wetland component of the Waters of National Importance ("WONI") project.

6. I have also been appointed by the Oceania Government members of the Ramsar Convention[1], as their Regional Networker on the Scientific and Technical Review Panel (the "STRP") of the Convention, since 2005. I am currently in my second term with the

[1] The Ramsar Convention is an International Convention on Wetlands. New Zealand has been a signatory to the Ramsar Convention since 1976. The preamble of the Convention text states that "*wetlands constitute a resource of great economic, cultural, scientific, and recreational value, the loss of which would be irreparable*" and that the Contracting Parties desire "*to stem the progressive encroachment on and loss of wetlands now and in the future*". Hence avoiding further wetland losses has been the overall objective of the Ramsar Convention.

STRP and in this capacity liaise with and support all Ramsar national focal points from the Oceania region. I also participate annually in the STRP meetings held with other wetland experts from around the world. The meetings aim to provide advice to the Secretary-General of the Convention and help progress and improve the implementation of the Triennium programme adopted at the Ramsar Conferences of Parties which is held every three years (the last one was held in October 2008 in Korea). In this role I have developed familiarity with the concept of 'offsets', as the Panel was instructed by the 10th Meeting of the Contracting Parties (COP10) in 2008 to "*develop guidance on mitigation of and compensation for losses of wetland area and wetland values, including lessons learned from available information on implementation of 'no net loss' policies*".

7. Since completing my Ph.D I have worked as a scientist with the Department of Scientific and Industrial Research on the ecology of benthic algae in river ecosystems (1990-1992) and as a scientist and planner for "Station Biologique de la Tour du Valat" (1992-1994), a Research Institute dedicated to the Conservation of Mediterranean wetlands. Between 2006 and 2009 I held the position of Chief Technical Advisor for the newly established Regional Office for Oceania of the International Union for the Conservation of Nature (the "IUCN"), based in Suva (Fiji).

8. I have written over 30 reports and publications including 11 refereed scientific articles, with in particular a chapter on wetlands (as co-author) in the 2004 *Freshwaters of New Zealand* and a book (also as co-author) on *Wetland types in New Zealand* also published in 2004. I am also a co-author of *Wetland ecosystems of national importance for biodiversity: criteria, methods and candidate list of nationally important wetlands* (Ausseil et al, 2008) which was then published as Ausseil et al (2011), in a special issue of *Freshwater Biology* that includes the first major compilation of studies on systematic conservation planning in fresh waters worldwide.

9. I have refereed articles related to wetland research for several scientific journals.

10. I am a member and a past committee member of the New Zealand Freshwater Sciences Society. I have been a Trustee of the National Wetland Trust of New Zealand for several years.

11. I am familiar with ecological issues associated with wetlands in New Zealand and in the Manawatu-Wanganui Region, which I have become familiar with on several visits to the Horizons Regional Council and several discussions with staff there over the period I worked on the WONI project and more recently (December 2011). I have also visited

wetlands in the region with several of my DOC colleagues on several occasions. Over my time in New Zealand, I have visited many wetlands, both on public conservation land administered by the Department of Conservation and on private land. My work has involved mainly compiling inventories (wetlands and wetland species), site value assessments, vegetation mapping and providing wetland management advice to the Department's rangers and to Resource Management planners.

12. I have read the Code of Conduct for Expert Witnesses (Environment Court Practice Note 2011) and agree to comply with it. I have complied with the Code in the preparation of this evidence. I have not omitted to consider material facts known to me that might alter, or detract, from the opinions expressed.

SCOPE OF EVIDENCE

13. My evidence will cover the following:

- the importance of New Zealand wetlands nationally and regionally;
- a brief overview of the functions and values of wetlands;
- the extent of loss of wetlands nationally and regionally;
- the significance criteria in the Proposed One Plan Policy 12-6;
- the wetlands in schedule E; and
- the concept of biodiversity offsets as it applies to wetlands.

THE IMPORTANCE OF WETLANDS NATIONALLY AND REGIONALLY

14. Wetlands contain a disproportionate number of New Zealand's threatened plants and animal species. They cover less than 1% of New Zealand's land area yet contain 23% of indigenous vascular plants classified as threatened or uncommon (from de Lange et al 2009), 12% of all threatened invertebrates, 16% of nationally critical bird species, and 29% of all threatened freshwater fish (from Hitchmough et al. 2007).

15. New Zealand freshwater wetlands comprise a variety of classes based on distinctive combinations of water regime, nutrient status, pH and substrate (Johnson & Gerbeaux 2004). The main functional classes are bog, fen, swamp, marsh (including ephemeral wetland), and shallow open water.

16. Functionally, New Zealand wetlands are similar to wetlands elsewhere in the world, particularly in response to hydrological and nutrient gradients.

17. Compositionally, however, New Zealand wetlands are unique. Eighty-two per cent of our indigenous flora, including many of our iconic wetland species, is endemic i.e. found nowhere else in the world. Examples relevant to the Manawatu-Wanganui region include kahikatea (*Dacrycarpus dacrydioides*), swamp maire (*Syzygium maire*), cabbage tree (*Cordyline australis*), red tussock (*Chionochloa rubra*), purei (*Carex secta*), and *Olearia* shrubs. These species often dominate large areas to form distinctive and unique wetland ecosystem types.

18. Several wetland sites in the Manawatu-Wanganui were included in the Directory of Wetlands in New Zealand ("the Directory"), published by the Department of Conservation (Cromarty et al. 1996). The Directory was initiated as part of the Oceania Wetland Inventory which was prepared under one of the objectives of a joint venture between Wetlands International, the Ramsar Bureau and the South Pacific Environmental Programme. It aimed to identify sites with potential for Ramsar status (i.e international significance).The Directory is a compilation of what were known, or thought to be at the time, the most outstanding wetland sites throughout New Zealand.

19. The main reason for inclusion of these wetlands in the Directory is because the wetlands are good examples of certain wetland types which are nationally uncommon and vulnerable, good habitats for threatened species and/or important fisheries, and make a contribution to biodiversity.

20. The Directory, while a useful start, is merely a list of what was thought to be internationally significant at the time it was compiled and does not include sufficient representation of different wetland types. Since then our wetland knowledge has improved, a wetland classification or typology system has been developed (Johnson and Gerbeaux 2004) and a method developed to identify conservation priorities (Ausseil et al. 2008, 2011).

21. One of the sites in the Directory, the Manawatu Estuary, has since received official international recognition when it was declared a Ramsar site in 2005.

FUNCTIONS AND VALUES OF WETLANDS

22. The values and functions of wetlands in relation to resource management have become better recognised in recent years and efforts have been made to quantify the "free

services" and amenities that wetlands provide to society. These include life-supporting/ecological values and production/socio-cultural values as follows (and in no particular order):

- hydrological values/functions (flood storage and mitigation, groundwater recharge/discharge, maintenance of summer base flows, lagoon/estuarine flow modification);
- geomorphologic values/functions (erosion protection);
- chemical values/functions (carbon sinks, nutrient assimilation, sediment trapping and toxicant removal, biogeochemical cycling);
- biological values/functions (productivity, wildlife habitats and fish nurseries, biodiversity, corridors); and
- production/socio-economic-cultural values/functions (commercial fisheries, peat extraction, plant harvesting, recreation, education, cultural and spiritual values).

23. The Manawatu-Wanganui wetlands perform all these functions to various degrees (Lambie 2008) and therefore provide a wide range of ecosystem services.

24. It is becoming increasingly common to group these functions and values under the term of "ecosystem services". Ecosystem services are often described as the benefits people obtain from ecosystems whether directly obtained as provisioning services (i.e. products obtained from ecosystems), regulating services (i.e. benefits obtained from regulation of ecosystem processes) or cultural services (non material benefits obtained from ecosystems), or indirectly obtained as supporting services (services necessary for the production of all other ecosystem services – like soil formation, nutrient cycling or primary production). By way of example, wetlands can contribute to maintaining the overall quality of fresh water through sustaining flows in lowland streams. In relation to climate change, we are seeing more regular periods of droughts or floods. Wetlands can mitigate negative impacts of such climate change by storing excess water. Benefits derived from these services and associated with wetlands have been demonstrated as having high economic values.

25. Wetland ecosystem services have been quantified in dollar values by ecological economists. On a global scale wetlands (includes estuarine and freshwater) are one of the most valuable ecosystems in the world. They are valued at US$10,000–$20,000 per hectare per year, compared with only US$300 per hectare per year for temperate forests (Costanza et al. 1998). In New Zealand, the value per hectare of the ecosystem services provided by freshwater peatlands/wetlands is estimated at NZ$34 184 per annum (Cole & Patterson 1997).

THE EXTENT OF LOSS OF WETLANDS NATIONALLY AND REGIONALLY

26. New Zealand wetland ecosystems have been severely reduced in extent as a result of human settlement. Freshwater wetlands (including forested wetlands) originally covered an estimated 2.4 million ha, nearly 9% of the total area of New Zealand (Ausseil et al. 2008, 2011).[2] The current total extent of wetlands is estimated to be 249 776 ha, or about 10% of historic extent (Ausseil et al. 2008).[3]

27. This loss of wetlands is one of the most extensive and rapid rates of loss of these ecosystems for any country in the world. Mitsch and Gosselink (2000) noted that "For a *small country, New Zealand has a wide variety of wetland types....However, New Zealand has lost 90 percent of its wetlands...*, pp 38-50". Even in Europe, countries have often suffered less wetland loss. Cromarty and Scott (1996) note that there has been a considerable history of modification and use of wetlands in New Zealand following both Maori and European settlement.

28. Within New Zealand, the greatest wetland loss (in terms of proportion) has been in the North Island (Ausseil et al 2008), with only 4.9% remaining, whereas in the South Island (including Stewart Island), 16.3% remains. The extent of wetland loss is variable at the regional level, ranging from a minimum of 1.9% remaining for Hawke's Bay, to a maximum of 24.4% remaining for Otago (Ausseil et al. 2008)[4]. In this report the Manawatu-Wanganui Region was found to have only 2.6% of original wetlands remaining which updates estimates made by Horizons staff of 3.04% (Maseyk 2007). Therefore, the Region is only sitting just third from the bottom in regards to regions with the least wetland remaining (just slightly above Wellington region with 2.3% remaining and Hawke's Bay with 1.9% remaining).

29. This means that remaining wetlands in the Manawatu-Whanganui region have a special significance both regionally and nationally.

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[2] This determination was based on soil information and a 15-m digital elevation model (DEM).
[3] Current extent was assessed by combining existing databases, maps, surveys and a 15-m DEM, and checked using satellite imagery. Both previous and current extent estimates are the best available at a national scale.
[4] Ausseil et al (2008, 2010) rank West Coast lower than Otago but due to nature of the West Coast Environment, the difficulties linked to the mapping of wetlands (high rainfall levels making the whole region "wet", extensive forest cover preventing remote sensing techniques to properly retrieve wetlands) and remoteness of many wetlands do not enable to be conclusive on extent. The authors have accepted that the extent of wetlands remaining is likely to be at least 30%

30. The most insidious changes have involved the "nibbling away" at the edges of wetlands, resulting in incremental and cumulative loss. This often occurred (and still occurs) because of lack of understanding of how wetlands function and the resultant failure to properly secure wetland boundaries.

31. Individually, the loss of small wetlands or corners of large wetlands may not have seemed important in the past. However, the cumulative effects of these losses have been serious for native wetland plants, fisheries and some birds, both nationally and regionally. The losses have impacted not only on biodiversity values but on the ecosystem services discussed above.

SIGNIFICANCE CRITERIA IN THE PROPOSED ONE PLAN POLICY 12-6

32. The approach to determining what is "significant" for the purposes of section 6(c) of the RMA is still being refined, as defined criteria have not been set at a national level under the Act (the proposed NPS on Biodiversity has not been finalised). However, recent work I was involved in through Environment Court hearings on the Proposed West Coast Regional Land and Riverbed Plan provide support for the development of criteria to determine significance.[5]

33. Horizons has proposed a set of criteria for determining significance in Policy 12-6(a) and I generally endorse them. I note that these criteria are also to be used to assess the adverse effects of particular activities against values that make a site "significant" (under Policy 12-6(b)).

34. I agree with the Minister of Conservation's appeal point that the words *"functioning ecosystem services"* should be removed from Policy 12-6(a)(i)(C). I participated in expert caucusing on this matter (30 January 2012) and I agree with the deletion of those words from Policy 12-6(a)(i)(C) and their inclusion in (a)(i)(B).

35. Policy 12-6(a) sets out criteria in terms of three categories: representativeness; rarity and distinctiveness; and ecological context. Aside from the 'functioning ecosystem services' point noted above, I agree with the specific criteria set out under each of these categories.

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[5] *Friends of Shearer Swamp v West Cost Regional Council*: Environment Court decisions [2010] NZEnvC 345 and [2012] NZEnvC006 and High Court decision CIV-2010-409-002466.

36. However, in my view, the criteria relating to the percentage of remaining cover, "*comprising indigenous habitat type that is under-represented (20% or less of known or likely former cover)*" ((a)(i)(A)) should actually be listed under the 'rarity and distinctiveness' category (a)(ii). Although I am not recommending a change to the Policy at this stage, I simply note that I view habitats with less than 20% remaining as 'rare'. In my view not all of these habitats will be 'representative' in the way that I would use that term[6]. This was the way the criteria were analysed and placed under relevant headings in the West Coast case hearings.[7]

37. In those hearings, it was accepted that overall the extent of wetlands remaining in the West Coast Region was high (more than 30%) and that some habitat types still remained in even larger extents in the West Coast Region. Therefore such wetland types were not considered as 'rare' in the sense of having less than 20% extent remaining. The focus in that case was therefore upon whether those wetland habitats/types (e.g. swamps) were significant under the 'representativeness' criterion.

38. However, in the Horizons Region we are dealing with a region which has a small fraction of its original wetlands remaining. All Schedule E wetland types in the Horizons Region fall within the 'rarity' category and meet the criteria of having far less than 20% original cover remaining. All such wetlands are therefore significant for the purpose of section 6(c) of the Act, without needing to also assess the separate criterion of 'representativeness' as was necessary for the West Coast Region. This is a differing use of terminology 12-6 and, as stated, I am not recommending that Policy 12-6 be altered to move the 'less than 20% remaining' to the rarity part of the Policy in the Horizons One Plan, however, in order to be consistent with the approach I endorsed through the West Coast hearings I felt it was important to highlight.

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[6] I acknowledge that the MfE Statement of National Priorities document and the draft NPS on Biodiversity state this 'less than 20% remaining' threshold or criterion as part of the 'representativeness' concept, but in my view placing that criterion as part of the 'rarity' concept would be preferable.

[7] During those hearings ecologists agreed during caucusing that "representativeness" had two parts as follows:

"(a) Indigenous wetland vegetation types that have the following attributes:

(i) The indigenous wetland vegetation types that are typical in plant species composition and structure; and

(ii) The condition of the wetland is what would have existed prior to 1840 in that:

- *indigenous species dominate; and*
- *most of the expected species and tiers of the wetland vegetation type(s) are present for the relevant class of wetland.*

OR

(b) the wetland contains indigenous fauna assemblages that:

(i) are typical of the wetland clas; and

(ii) indigenous species are present in most of the guilds expected for the wetland habitat type."

39. I note that at Council-level hearings on the Proposed One Plan there was discussion on whether a 'condition' or 'sustainability' criterion should be added as an additional requirement for assessing a site as "significant" under section 6(c) of the Act. I do not address this point because, insofar as that concept is encapsulated in the phrase "*functioning ecosystem services*", the matter has been agreed by all expert ecologists following caucusing. I do note however that, although I do not consider 'condition' or 'sustainability' should be a requirement when considering whether a site is "significant" under the Proposed One Plan, such considerations are useful when:

(a) Assessing how a site should be managed, including assessing the degree of adverse effects that may be acceptable for that site[8]; and

(b) Prioritising funding for non-regulatory methods such as planting, fencing or pest control.

40. Quantitative work has recently become available to rank wetlands, offering useful guidance in relation to both these matters.[9] It is notable that this work includes a mean condition index, assessing 60% of New Zealand wetlands to be at less than 0.5 on a scale from zero to one. These results clearly reflect the high levels of human-induced disturbance pressure in New Zealand wetlands.

41. Figure 1 below shows that for the two units present in the Manawatu-Wanganui Region, the Region is nationally amongst the lowest scores. Yet when complementarity[10] and irreplaceability[11] is considered in addition to 'condition', the Manawatu-Wanganui rankings improve and many wetlands from the Region are retrieved. Therefore the study does not necessarily rank highly only wetlands with a high condition index. So, even in relation to matters (a) and (b) above, focussing only on the 'condition' of a site is simplistic. Such an analysis creates a danger that other matters that contribute to the overall importance of a site will be overlooked.

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[8] This is provided for in Policy 12-6(b).
[9] Ausseil et al (2008, 2011) has proposed an objective method to assess priority wetlands, including using 'condition' as a means to rank wetlands.
[10] Complementarity ensures that each new wetland area selected complements the diversity of sites already chosen.
[11] Irreplaceability considers the scale of habitat loss to identify threatened habitats at the biogeographic scale.

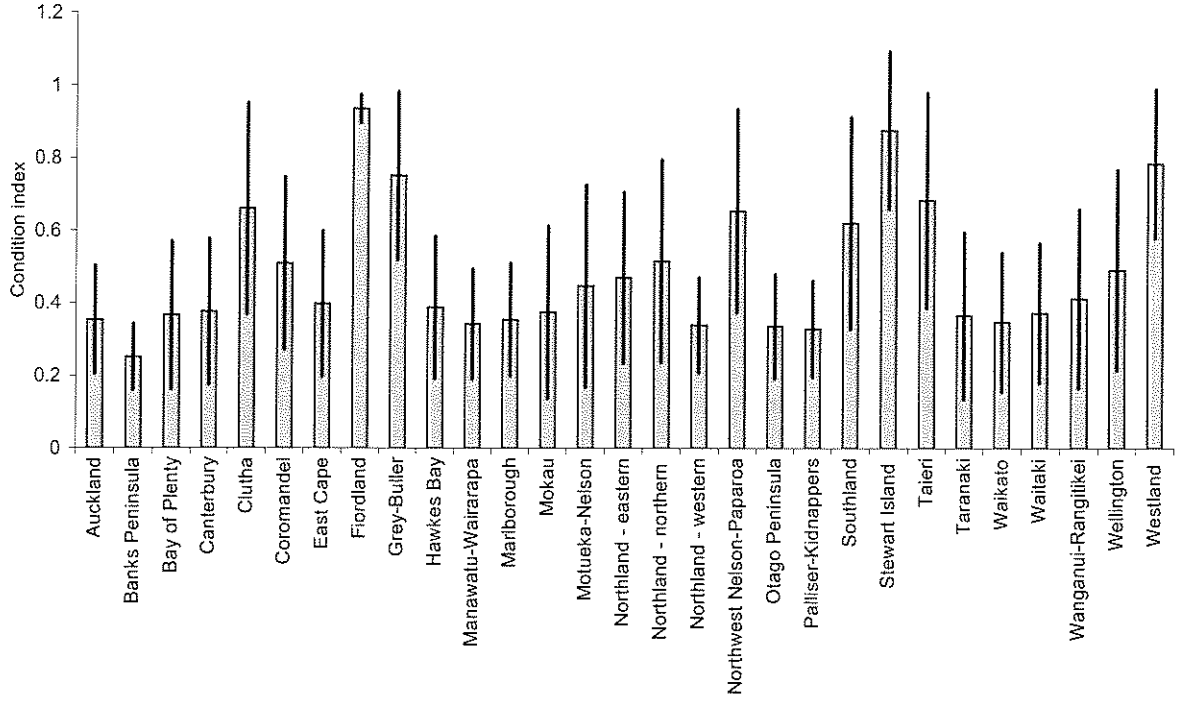

FIGURE 1: Mean condition index (and standard deviation) of all New Zealand wetlands in each biogeographic unit. Manawatu-Wanganui region includes all or a proportion of the Wanganui-Rangitikei and Manawatu-Wairarapa biogeographic units.

WETLANDS IN SCHEDULE E

42. There are several wetland types that are listed in Schedule E to the Horizons One Plan. Some of these wetland types are categorised as rare and some as threatened. As explained in the evidence of Ms Hawcroft, rare habitats are naturally uncommon ecosystem types. Rare habitats are often difficult to map either due to their underground nature, their small extent or their ephemeral characteristics (rare wetland types include karst systems, dune slack wetlands, pakihi wetlands, springs, seepages and ephemeral wetlands). Threatened habitat types are habitats where there is 20% or less remaining in the Region. At the regional scale all wetland types other than those identified as rare in the Horizons Region (i.e. saltmarshes, swamps/marshes, fens/bogs) are threatened.

43. I have reviewed the methodology used to identify habitats, including wetland habitats, within Schedule E Table E1 of the One Plan (Maseyk 2007).

44. The wetland habitats are in my view correctly identified in the Schedule. It should be noted that for wetlands, the labels used correspond to labels describing wetland 'classes' (Johnson and Gerbeaux (2004)) – e.g. swamp/marsh, bog/fen etc - typically adopted for New Zealand. I agree that this is preferable to utilising the labels assigned to other habitat types (of the like of forests and tussocklands) which lend themselves more easily to 'structural' (e.g. forest/treeland/tussockland etc) or 'compositional' (e.g. kahikatea-pukatea-tawa/kanuka etc) classes. This is mainly because wetland habitats are a lot more complex, often forming mosaics of overlapping habitats difficult to map out (compared with forest for instance). It is therefore the appropriate level to use in assessment of significance.

45. This is important because a wetland 'class', as compared to a wetland 'structural' or 'compositional' class, describes "*distinctive combinations of substrate factors, water regime, and the consequent factors of nutrient status and pH*" (Johnson and Gerbeaux (2004). Each of these combinations will support different indigenous plants, and different habitat for indigenous fauna. There is also adequate description in the definitions attached to the labels to the possibility of wetlands containing forest or treeland components. Conversely, some forests (e.g. kahikatea-pukatea forest) can be treated as swamp wetlands as appropriately noted in the further description for that particular type of forest in Schedule E.

46. I agree with the status assigned to the wetland habitats described in the habitat descriptions in Schedule E of the One Plan. All these types are indeed 'rare' or 'threatened', reflecting the large loss I reported earlier. Being less than 20% of the original cover they are therefore "significant" under the criteria agreed under Policy 12-6 of the Proposed One Plan.

47. It is equally appropriate that wetlands meeting the criteria contained in Table E2 are excluded from being considered as rare or threatened ecosystems. This Table will prevent for example wetland habitats dominated by pasture or exotic species in association with sedge and rush species being treated as significant. An example of this type of situation is provided in Annexure 1. However, an area dominated by raupo or flax (or any other native species), if not in a drain or a ditch, and if meeting area size criteria highlighted in Table E.2(a), would be regarded as significant.

BIODIVERSITY OFFSETS

48. I support the reference to biodiversity offsets in the Horizons One Plan provided that the meanings currently associated with the term under the BBOP ("Business and Biodiversity Offset Programme"), and described in detail in the evidence of my colleague Mr. Spencer Clubb, are utilised.

49. The starting point for understanding offsets for wetland losses is the imperative to seek to avoid wetland losses (or degradation) in the first instance. Alternative measures such as securing the conservation of other existing wetlands should generally be considered a less appropriate option.

50. The Horizons One Plan refers to offsets providing a 'net gain'. The compensation provided should address both the areal extent and the functional performance of the wetland. Therefore, it is necessary to understand the range of ecosystem services provided by the wetland, its physical size, and the type of biodiversity a wetland supports prior to considering and developing compensatory habitat.

51. The principle of '*like for like*' in the context of biodiversity offsetting is important. Any impact on any type of wetland, for instance, an area of dune wetland – e.g. a flaxland and cabbage-treeland swamp - that cannot be completely avoided or minimised, rehabilitated or restored as the result of an activity, should be compensated by the rehabilitation, restoration or creation of a similar wetland type.

52. In the example of a dune wetland containing flax and cabbage-tree, these wetlands have unique characteristics such as helping maintain the supply of food to birds that need nectar at certain times during the year to complement their diet (tui for example use lowland flaxland when they cannot find food in the forests). 'Exchanging' such a wetland for another wetland type would not fulfil this need.

53. Another example may be an area of floodplain swamp containing kahikatea and carex sedgeland. Such habitat provides provide food supply for those animal communities feeding on kahikatea/sedge seeds. Another wetland type would not fulfil the same function. I attach illustrations of these two types of wetlands in Annexure 2.

54. The hydrological regime of a floodplain wetland (presence of surface flooding associated with a riverine sytem) also creates habitat for different types of invertebrate communities.

Threatened wetland plants (close to 40 different species are present in the Horizons region) also have specific habitat requirements – in terms of fertility, vegetation structure, periodicity of inundation.

55. In summary, a 'net gain' cannot be achieved if offsets are generally allowed in habitat types that differ from the habitat type being disturbed. Allowing offsets in these circumstances would not maintain indigenous biological diversity in the Region.

56. The location of any compensatory wetland habitat is important. Ideally it should be close to the impacted wetland and within the same hydrological catchment or coastal zone. For example, short-lived plants (threatened or not) require to be able to move between ephemeral habitats which means that proximity and connectivity are key concerns for any restoration. There is already evidence, from the work of Whanganui DOC staff involved in dune wetland restoration, that there is no certainty for some threatened plants that they will colonise new habitat even over short distances (e.g. *Sebaea ovata).*

57. In addition, there are some habitat types within Schedule E of the One Plan where offsets may be inappropriate altogether, such as for many of the 'threatened' and 'rare' habitat types. As explained in Mr Clubb's evidence, under the BBOP principles, *limits* to biodiversity offsetting exist when a habitat or ecosystem is "vulnerable" or "irreplaceable". Ausseil et al (2008, 2010) makes reference to the importance of using 'irreplaceability' when prioritising conservation actions.

58. Irreplaceability reflects the potential of each wetland to be substituted by another for the purpose of protecting a full range of biodiversity. If a component of biodiversity (e.g. a habitat type or a population of a threatened species) is represented by a single site, then irreplaceability is maximal because no other site can contribute to the biodiversity it contains. Obvious examples of irreplaceable wetlands would be dune ephemeral wetlands - many such wetlands contain threatened plants unique to these types of habitats (Johnson and Rogers 2003) - and peatlands. When one considers peatlands, the time scales required to build peat layers would make such type of wetland entirely inappropriate for offsets.

CONCLUSIONS

59. New Zealand's wetlands, including those present in the Manawatu-Wanganui region hold important functions and values and provide many ecosystem services.

60. Many of them are internationally and nationally significant.

61. About 90% of the original New Zealand wetland cover has been lost and the extent of loss of wetlands within the Horizons Region compared with other parts of the country is one of the highest (standing only behind Hawke's Bay and Wellington Regions).

62. I am very supportive of the approach taken in the One Plan to assign a status of threat to wetland habitats present in the Region, and I agree that all wetlands should be recognised as significant in the Manawatu-Wanganui region, all wetland types being either 'threatened' or 'rare' in Schedule E of the Plan.

63. Offsets for wetlands should be regarded as a last resort, and potential impacts should be avoided, minimised, or be addressed with options for rehabilitation or restoration before offsets are considered.

64. Offsets should be "like for like", generally within same catchments, and should address both the areal extent and the functional performance of the wetland type being affected.

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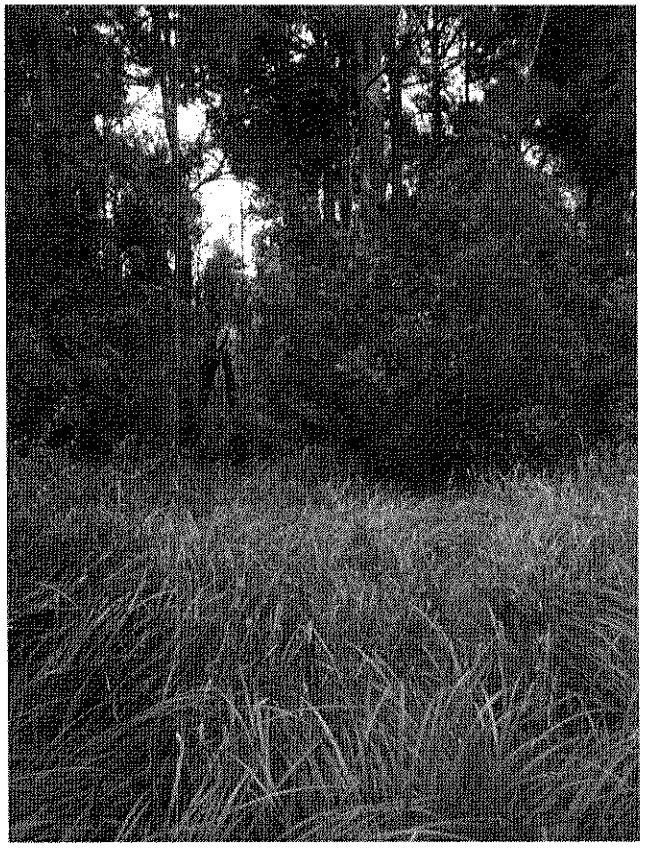
ANNEXURE 1

Example of a dune swamp that would not meet the significance criteria (indigenous component smaller than 0.1ha with the remainder dominated by pasture species).

ANNEXURE 2

Roundbush: a dune swamp containing flaxland and cabbage- treeland.



ANNEXURE 2 (cont.)

Gordon Park Scenic Reserve near Whanganui: a floodplain swamp with kahikatea forest and *Carex* sedgeland.

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