Rebuttal evidence of Dr Peter Espie

1. This rebuttal evidence addresses the evidence in chief of:
    a. Dr Susan Walker (for Environmental Defence Society)
    b. Mr Nick Head (for the Royal Forest and Bird Protection Society); and
    c. Some further reference to the evidence of Mr Harding where other evidence relies on it.

DR SUSAN WALKER

Ecology and significance of the Mackenzie Basin

2. The central assertion of Dr Walker (as well as Mr Harding and Mr Head) is that biodiversity in the Mackenzie District is inadequately protected and that vegetation clearance and ecosystem loss through agricultural development is the greatest threat. These claims are not supported by scientific evidence and I outlined this in detail in my evidence.

3. The most important significant indigenous vegetation communities and fauna habitats have already been identified in the Mackenzie Basin by the PNA , DoC tenure review and other surveys and have been adequately protected. The land systems Dr Walker consider most at risk are subject to over 59,120 ha of protection in various forms, and cover the entire range of originally rare ecosystems and threatened environment (Figure 1). No evidence has been presented that ***any*** indigenous vegetation community, fauna habitat or at risk species is not already present in protected areas.

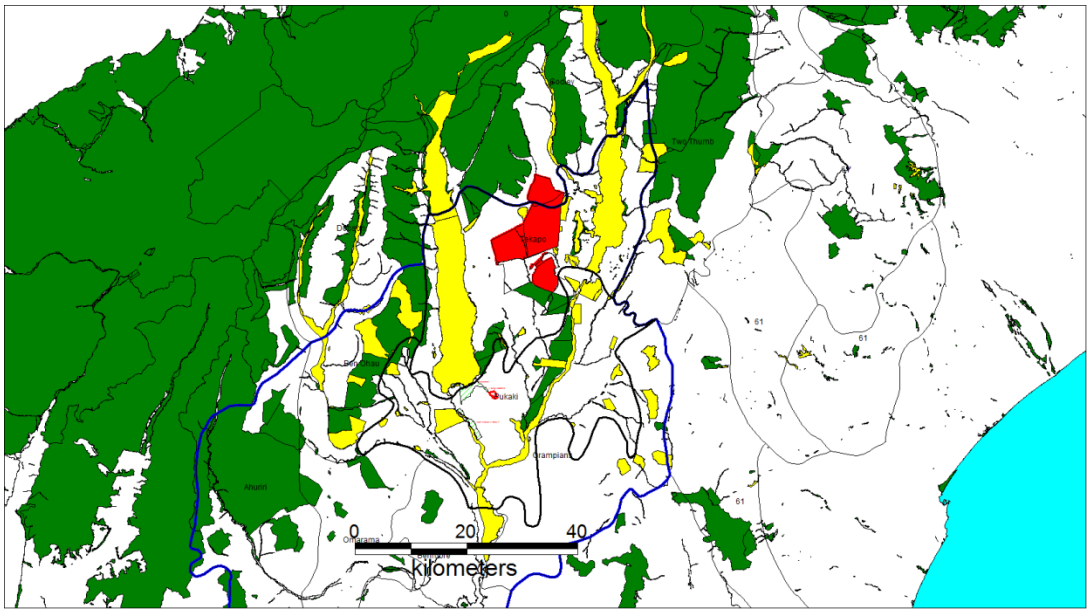
4. 

Figure 1. GIS analysis showing the extent and distribution of SONS & protected areas in the Mackenzie and surrounding areas. Green Crown land (DoC); Yellow MDC SONs; Red Other.

5. Dr Walker considers that basin floor indigenous dry land ecosystems remain undeveloped and occur together in continuous sequences unlike in other South Island districts (Paragraph 15.4). Her conclusion that '*the remaining areas of the basin floor that have not been converted could all now be regarded as nationally* significant' (Paragraph 18) and that the Mackenzie is the only place with realistic prospects of long-term persistence is incorrect for three main reasons:

a. most basin floor vegetation is highly modified and is no longer indigenous due to pasts human activity and exotic species colonisation;
b. dryland vegetation is subject to adequate protection in other districts; and
c. the argument that size and connectivity are required for the persistence of threatened species (Paragraphs 16.1, 16.2, 19) does not consider competitive exclusion nor the extensiveness and connectivity of existing protected areas.

6. The assertion that indigenous ecosystems and plant communities of the Mackenzie Basin floor are irreplaceable is not supported by field evidence e.g. the successful tussock re-establishment in the Tekapo Scientific Reserve or by the establishment of a population of the Nationally Vulnerable New Zealand mouse tail (*Myosurus minimus*) on a former dam on Simons Pass Station.

7. The fundamental assumption that effective protection can only be achieved by change in the extent of conservation land and subsequent regulation is incorrect and does not adequately consider implementation of active conservation through ecological restoration.

8. A key concept of Dr Walker's submission is that biodiversity protection can be achieved by legislative measures (Footnote 73) or by leaving a site intact (Footnote 74). This conflicts with evidence of long-term vegetation trends in the Mackenzie basin.

Edge effects

9. Dr Walker correctly notes that increased exotic grass cover is one of the most obvious changes in Mackenzie vegetation, but incorrectly attributes this to intensive land use (Paragraphs 23, 25). The early introduction of exotic grasses occurred during extensive pastoralism, resulting in widespread establishment of low-fertility tolerant pasture grasses without fertiliser. Her statement that intensive land development is fostering progressive exotic grass invasion into indigenous dryland vegetation (Paragraph 23) is simply incorrect. Introduced grasses used in developed high fertility pastures (e.g. ryegrass), do not spread into low fertility soils.

10. She does not comment on the equally obvious increase in the exotic weed Hieracium, or on its ability to compete for soil moisture and nutrients. Her statements that dryland indigenous species " … compete well for water below ground …" (Footnote 32) conflicts firstly with the obvious displacement of many species and directly with actual scientific measurement of Hieracium's uptake of soil moisture and nutrients in in basin floor grasslands.

11. Dr Walker's contention that developed land use practises have adverse effects on indigenous vegetation at considerable distances beyond their footprints (Paragraphs 27, 28, 29, 30) is simply not supported by field evidence in the Mackenzie: marginal vegetation remains unchanged 10 – 15 m beyond centre pivot irrigation.

12. Dr Walker's statement at Paragraph 23 in relation to 'cross-invasion' is not supported by other studies. Measurement of irrigation effect on adjacent vegetation in the Mackenzie showed edge effect of increased grass growth only occurred in 4-5 m with no change beyond 10 – 15 m (Figure 2).

Figure 2. Boundary between pivot irrigated and adjacent vegetation, Simons Hill Station

13. Dr Walker cites as evidence local patches of high exotic grass cover in the Tekapo Scientific Reserve as occurring at 336 m from an irrigated edge, but does not provide evidence of consistently high cover in the intermediate distances. Monitoring plots located inside the reserve, beyond any possible edge effects, show exotic grasses browntop and sweet vernal frequently have high cover, and Dr Walker here and elsewhere (Paragraph 26) does not adequately consider resident vegetation. Therefore I consider scientific evidence does not support her conclusion land use practises are having measurable adverse effects on indigenous vegetation at considerable distances beyond their footprints (Paragraphs 27, 28, 29, 30).

14. I agree that light competition from tall growing species restricts growth of low-growing indigenous plants, but note that this would equally have occurred under indigenous communities and species e.g. scrub and tall tussock grassland that occurred in the basin floor communities prior to historical anthropogenic clearance. The range expansion and increase in frequency of low growing species, including at risk species, is a direct consequence of reduction in vegetation stature and may be assisted by pastoral grazing.

15. Dr Walker appears to recommend inclusion of intensive grazing and edge effects in the proposed definition of vegetation clearance activities (Paragraph 50). This would be extremely difficult to implement due to the wide range of different stocking rates and periodicities of grazing used in the basin. I note that intensive grazing occurs almost exclusively on developed grassland with less intensive stocking on lower producing grassland.

Approach to assessment of significance

16. Dr Walker, apparently from desktop visual assessment, agrees that most areas of Mr Harding's 'partially-converted' land are robustly mapped. Actual ground survey results do not support this confidence, as I have set out in my evidence.

17. She also considers that most areas of 'un-converted' land would be classified as significant indigenous vegetation, based on Mr Harding's proposed definition and the CPRS criteria (Paragraph 33). Dr Walker cites landform mapping (Footnote 55) as supporting evidence. Having visited some of these sites as part of my field work to inform my evidence, I disagree with this conclusion.

18. Most critically, the areas mapped as 'partially converted' incorrectly include areas principally consisting of fertilised low-fertility tolerant pasture species which are more properly classified as converted pasture.

MR NICHOLAS HEAD

Ecological overview of the Mackenzie Basin

19. Mr Head correctly identifies rabbits and exotic plant species as co-factors responsible for the widespread depletion in native dryland Mackenzie ecosystems. However, he incorrectly implies they are ecologically resilient (Para 5.6). This is not supported by observable widespread ecosystem change or long-term scientific monitoring studies as my evidence demonstrates.

20. His statement that Tekapo Scientific Reserve study demonstrated ecological recovery on depleted moraine and outwash systems from overgrazing and weed invasion (Paragraph 5.7) is only partially correct and cannot be universally extrapolated. Fescue tussock increased due to removal of rabbit herbivory, but not stock grazing, as this simultaneously occurred in adjacent grazed grassland (Figure 3). Decreased rabbit herbivory was responsible in both sites.

Figure 3. Grazed fescue tussock recovery 2004 – 2010, Glenmore station.

21. Secondly, increase in tussock stature only occurred on deeper soils. There has been no fescue tussock recovery on shallow Larbreck soils between 1993 – 2021. After 28 years only 2% of fescue tussocks occurred on the shallow phases of Fork Soils, 98% on deeper phases.

22. Thirdly, apart from taller sub-shrub species which increased by 0.1% cover in 2010, other indigenous declined in cover (-0.6 to -1.0%) and introduced grass cover increased by 10.4%. These trends continued in 2021.

Maryburn Outwash case study

23. Mr Head's case study of the Maryburn outwash (Section 8) unequivocally demonstrates the successful protection of both a continuous sequence of basin floor dryland ecosystems and at risk species. Yet he considers that the Department of Conservation's evaluation and assessment of Maryburn and adjacent stations inadequate and resulted in freeholding of significant basin floor land (Paragraphs 8.7, 8.8). This is completely incorrect as the Maryburn Conservation Area is 4,092 ha, the adjacent Irishman Creek Conservation Area is 2,600 ha, the Tekapo Scientific Reserve is 1,000 ha, providing extensive protection of the complete suite of dryland basin floor ecosystems, species and habitats.

24. I conclude current protected areas adequately represents these systems in the Mackenzie basin.

9 March 2021.