EFORE THE HEARINGS PANEL APPOINTED BY CANTERBURY REGIONAL COUNCIL

UNDER the Resource Management Act 1991 (RMA)

AND

IN THE MATTER of an application by Canterbury Regional Council

for resouce consent to discharge agrichemicals to rivers and their connected waterbodies, air and the coastal marine area, and the clearance of vegetation, for the purposes of weed management to provide flood, erosion, drainage and river enhancement works.

STATEMENT OF EVIDENCE OF Greg Stanley
ON BEHALF OF CANTERBURY REGIONAL COUNCIL (APPLICANT)

11 March 2023

SUMMARY STATEMENT

My evidence outlines the ways in which Environment Canterbury is seeking to develop tools and strategies for controlling weed infestations that have a reduced dependency on herbicide application. These include new planting techniques and tools and mechanical removal of vegetation. The development of such methods is still in its infancy and presents both environmental and financial trade-offs. Environment Canterbury is committed to further investment into the development of these approaches and best practices.

Introduction

1 My full name is Greg Stanley. I am employed as the Regional Lead for Braided River Revival at the Canterbury Regional Council (**Regional Council**) and I have held this position since July 2022.

Qualifications and Experience

2 I have over 13 years of experience in environmental restoration and hold a Bachelor of Science and Post Graduate Diploma of Science in Ecology from the University of Otago which I completed in 2011

3 I have worked at Environment Canterbury for 9 years. I have been in various roles for the Rivers section, my current position is Regional Lead, Braided River Revival (BRR) which I have been in for 2 years.

4 As the BRR team lead I have led the development of BRR strategies and lead the Berm Transition Project which successfully delivered $10 million of enhancement and improvement works in more than 60 sites across 20 rivers, resulting in weed control over more than 1200 hectares and the installation of more than 250,000 plants.

5 I can confirm that I have read and am familiar with the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note 2023. I have complied with the Code of Conduct in preparing this evidence and I agree to comply with it while giving any oral evidence during this hearing. Except where I state that I am relying on the evidence of another person, my 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 that I express.

6 Although I am employed by the Regional Council, I am conscious that in giving evidence in an expert capacity that my overriding duty is to the Hearings Panel.

Scope of evidence

7 I have been asked to provide evidence on behalf of the applicant to inform resource consent applications to discharge agrichemicals and clear vegetation.

8 My evidence addresses matters under the following headings:

(a) **Overall comment on novel techniques**

(b) **Long term reduction – Berm transition**

(c) **Geotextiles and materials**

(d) **Out-of-scheme Fairway clearance; Ashley Rakahuri.**

(e) **Large scale fairway clearance alternatives: Rakitata Stoddard's island.**

(f) Proposed consent conditions, as relevant to my field of expertise.

9 In preparing my evidence I have reviewed the following documents:

(a) The application and assessment of environmental effects submitted by the applicant;

(b) Three requests for, and their responses of further information.

(c) The summary of submissions.

10 Such evidence is within my area of expertise.

Overall comment on novel techniques

11 Several novel techniques for plant establishment are presented in the following sections. They are intended to reduce or remove the need for herbicide use in berms as well as increasing the vegetation density and resilience against invasion by pest plant species.

12 While these methods either dramatically reduce or entirely remove the need for herbicide use, they still require machine work, generally in the form of vegetation clearance by a small digger. They are also labour intensive.

13 The use of these machines in and near riverbeds can introduce the risk of accidental discharge of diesel, lubricants or other fluids into the river corridor. These substances pose a real risk to habitats of concern and water quality, particularly the hydrocarbons in fuels and oil-based products.

Long term reduction – Berm transition

14 Canterbury has undergone massive land use changes in the past 100 years. Introduction of invasive plant species, either accidentally or for the purpose of flood protection or agriculture, have drastically changed the ecology across the plains and rivers. In river berms, we see a mix of maintained and purposely planted willow and poplar trees and lower stature weeds alongside vines.

15 Native plants that we would have commonly seen in these places would have been low stature, slow growing tussock and divaricating shrub communities with pockets of forest and wetland. All capable of responding to the regular disturbance expected near our braided river systems.

16 The deciduous tree cover allows patchy light to penetrate through and allows dense infestations of the weed species to develop. Native species cannot compete with the growth rate of the introduced species.

17 Weeds have encroached the active braid and lateral wetlands and drains, putting pressure on the flood protection vegetation, in many cases causing damage to trees and increasing the risk of damage in flood whilst simultaneously out competing native biodiversity.

18 In 2020 Environment Canterbury (ECan) received part-funding for six projects within their Climate Resilience and Flood Protection Programme (CRP) from the Ministry for Business, Innovation and Employment's Kānoa – Regional Economic Development and Investment Unit (Kānoa – REDIU). One of these projects - Berm Transition (BT) - sought to transform selected areas within the braided river berm into multi-functioning areas, increasing their diversity, resilience and flood protection function.

19 BT was an opportunity for Environment Canterbury to deliver flood protection in new innovative ways and to facilitate improved benefit to the flood protection scheme through the diversification of berm vegetation.

20 Works were delivered by 39 different companies including well-established ecological works contractors, civil engineering suppliers, tree removal specialists and Rūnanga business units including te Kete Tīpuranga o huirapa from Arowhenua and Te Rūnanga o Kaikoura Ltd.

21 Works were also performed in areas of high biodiversity value and co-managed alongside the Department of Conservation. One example of this was the delivery of weeding and planting at a site on the confluence of the Opihi river

with the Te ana a wai where several artificial bat roosts were erected and our works laid out around them to supplement the habitat.

22 By increasing the layers of native vegetation within the flood protection stands, light interception increases which in turn reduces the germination success of vine weeds and pest tree species. Spray maintenance is a necessary part of establishing these native plants.

23 Once installed vegetation is of a suitable height and some canopy closure has begun to take place, weed vigour will reduce and herbicide use can be relaxed. With regular passes, many of the regrowing vine species can even be manually removed.

24 Environment Canterbury will continue to pursue this berm-vegetation transition strategy as a core part of its infrastructure delivery (funding dependant).

Geotextiles and materials

Hydrophilic weed matting (Terrafelt).

25 This product has been used in various arrangements by Environment Canterbury over several years. The initial assets installed utilising these products were in the drier areas of McLean's island in the Waimakariri to establish nodes of dry-tolerant native species (see Figure 1 and Figure 2). These were soon followed by linear row installations into an area of forest-type berm land in the Sanctuary wetland reserve downstream.

26 Using this product alongside soils and wood mulch, plants were able to establish much quicker than neighbouring planting strategies, with the installed units growing many times faster than those in adjacent plantings under standard herbicide spraying regimes.

27 Over a period of three years the Terrafelt installations required only a single visit with cutting tools to remove gorse and broom regrowing through the seams and edges while the forest rows needed an annual pass with hedge shears and an edge-spray to knock back climbing pest vine species.

28 Following the success of these initial installations, the strategy was developed and repeated, becoming a standard strategy of delivery in the Berm Transition project.

29 Several large areas of Terrafelt nodes were installed in areas where conditions are generally considered to be harsh or arid (see Figure 3 and Figure 4 as examples). All plants are continuing to establish successfully as expected.

30 Further to the two strategies employed above (BT and Terrafelt) we also installed a series of “Terrafelt-Bag plants” into ‘scour bays’, freshly eroded bays of bare gravels following the flooding on the Ashburton river in May 2021 (see Figure 5). This was a new innovation showing likely success so far.

Figure 1 a "dryland node" installed at Harewood crossbank on the south bank of the Waimakariri

Figure 2 dryland nodes along McLean's island road on the south bank of the Waimakariri river

Figure 3, Extensive Terrafelt installations on the true right bank of the south branch Ashburton near Mt Somers

Figure 4, The same Terrafelt installations as in figure three, indicated by red dots.

Figure 5, Terrafelt bag planting process. a) filling bags in custom tri-pod stands; b) filled bags with plants; c) the custom ripper; d) two ribbonwood trees being planted (circled); e) ripper row in progress; f) tidying around planted plants.

Garto guards.

31 Developed by a start-up company in southland, the Garto guard is a UV-resistant plastic donut-shaped guard which is installed around a planted propagate, blocking light to immediately competing grass and other plant species (see Figure 6).

32 Garto have performed several trials between 2021 and 2023 and the BRR team has installed 5 guards in our sites in 2023. Growth response so far has confirmed that no herbicide spraying is required when plants are establishing with the guard successfully displacing all competing vegetation and the planted propagate successfully growing.

33 The BRR team will be performing further trials in the 2024 season with 50x guards to be installed. Further trials will determine whether this approach is viable on a larger scale.

Figure 6, Sammi from "Garto" (left) and Christina from BRR team (right) installing a "Garto guard" (centre) at a site on the Ashburton river.

Out-of-scheme Fairway clearance; Ashley Rakahuri.

34 Historically, maintenance of the active river channel or “Fairway” is only funded within the rated scheme areas via a targeted rate. Areas outside of these rated areas often have had no regular maintenance works and can often include the upstream reaches, where there are high biodiversity values.

35 Without regular maintenance, dense weed infestations form within the active channel and a reduction in active channel width. These choked reaches have a reduced capacity for floodwaters within the river system at times of high flow.

36 Several choked reaches were chosen for remedial clearance funded under the Climate Resilience Programme included areas on the south branch Hakatere / Ashburton, South branch Rakahuri / Ashley, Rakitata and Waipara rivers.

37 By way of example, the focus of clearance on the Ashley Rakahuri was a section between the Gorge and the Ōkuku River confluence, and a section of the Ōkuku River 7km upstream to the Grey River confluence.

38 Weed infestation of the fairway had caused northern channel migration in several locations, causing erosion and reduced the efficacy and function of the

vegetated berm as river channels and flow paths moving through it (Figures 9 and 10).

39 Work involved delineating a 200m wide central channel for clearance, leaving a good buffer of vegetation at the edges for flood and erosion protection (Figure 7). The total length was 24.1km of river bed and 578.3 Ha (Figure 8). Trees within the identified channel were sprayed by helicopter and trees with a standing base >100mm were mechanically felled and removed from the riverbed. A follow-up spray was then complete to prevent regrowth (Figure 11). Ongoing management on weed growth will be required to maintain the central channel that was created, otherwise weeds will return and choke up the river.

40 The total cost of works was $1.1million, equating to approximately $45,600 per km of riverbed. For comparison, Annual fairway maintenance spraying in the lower reaches of the Rakahuri/Ashley river is approximately $5000 pa, or $234 per km of riverbed.

41 In my experience with the upper Rakahuri / Ashley clearance is it is much more affordable and efficient to undertake regular maintenance than in a remedial fashion. It is also my experience that less disturbance of the riverbed is required through regular maintenance.

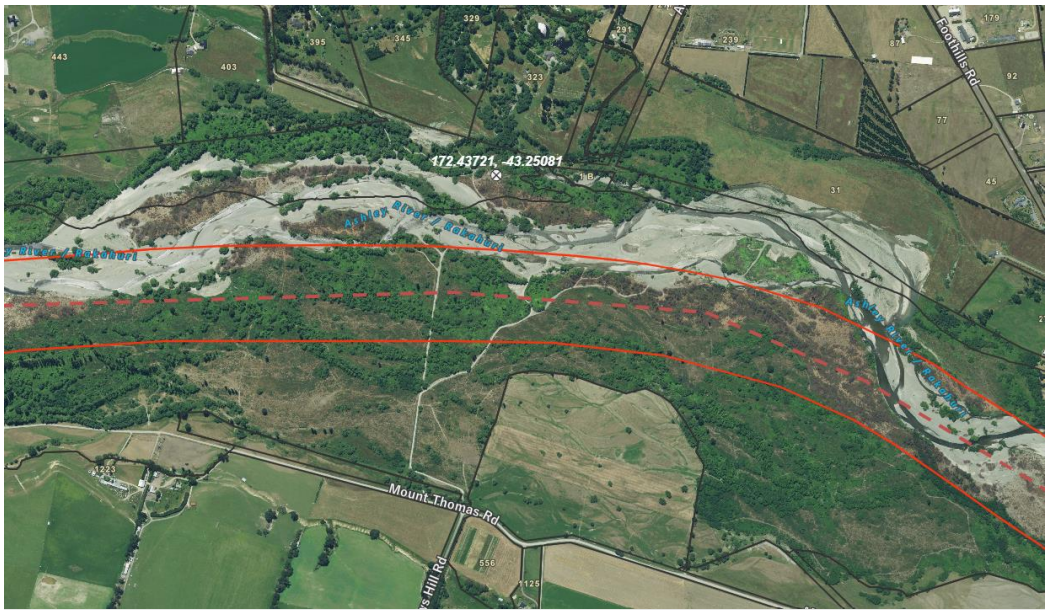

Figure 7, Northern Channel migration on the Ashley Rakahuri

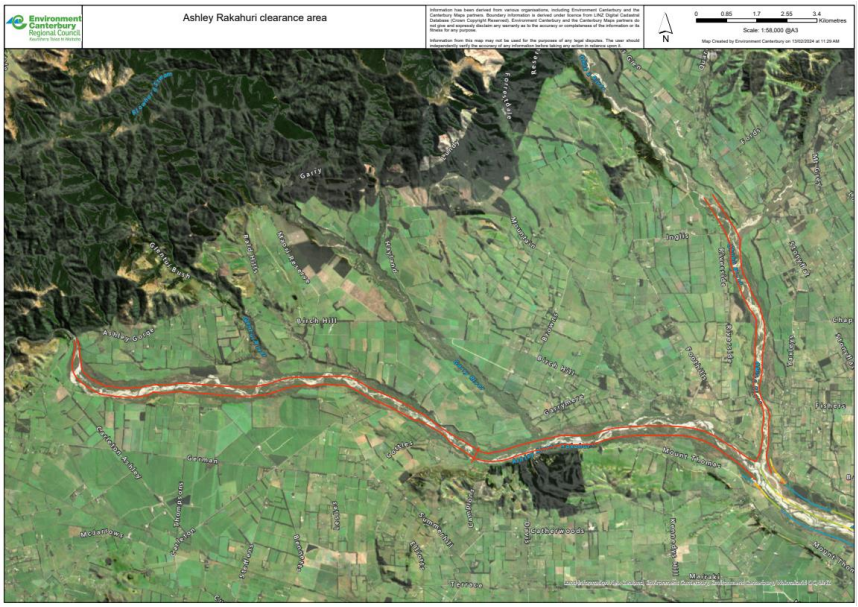

Figure 8, Planned area for tree clearance on the Ashley Rakahuri

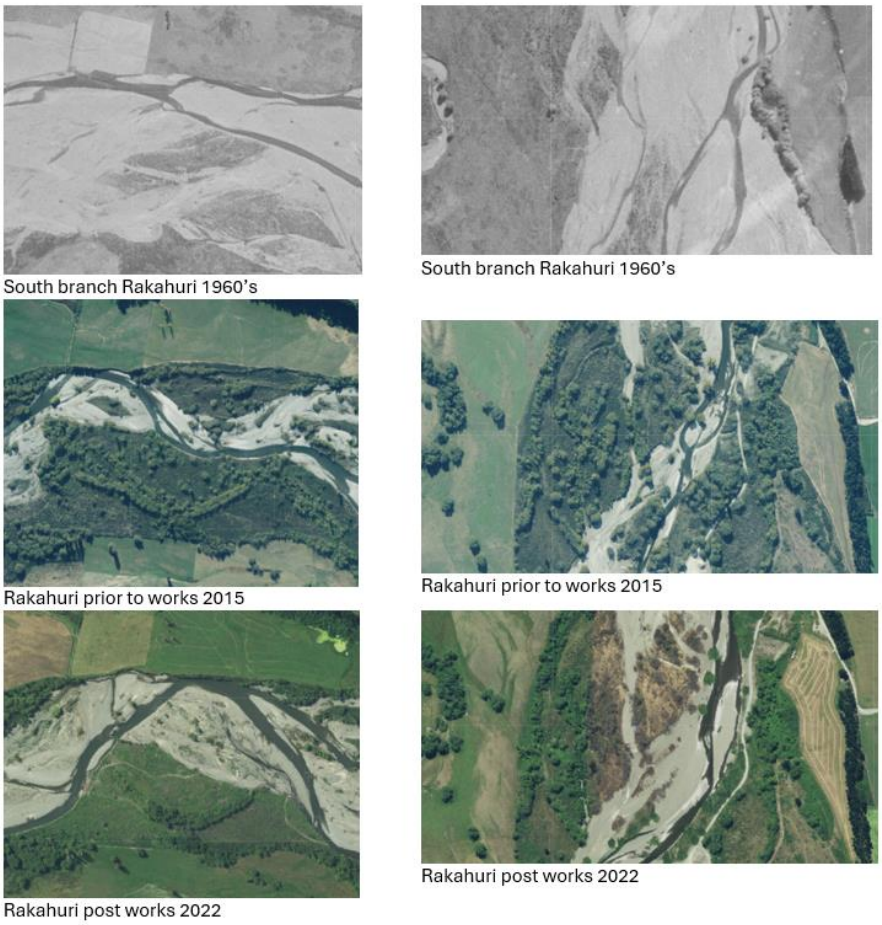

Figure 9, Sections of the Rakahuri prior to willow invasion (1960s), Prior to control (2015) and following works (2022)

Figure 10, The south branch of the Ashley Rakahuri before (above) and after (below) clearance works.

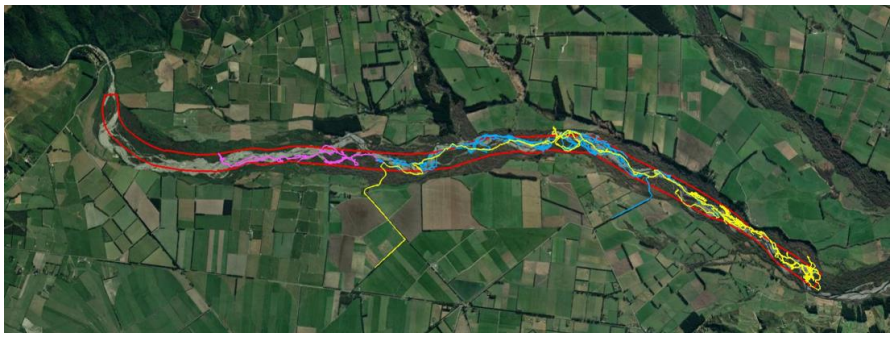

Figure 11, Follow-up control coverage targeting regrowing or un-controlled trees

Large scale fairway clearance alternatives: Rakitata Stoddard's island.

42 Stoddard's Island is the name given to a patch of land below SH1, that historically had a major braid running through it. Following migration of the river to the south, the channel became choked up with weeds and the channel did not re-occupy it. In an effort to make the area available for the river, a 53Ha channel of vegetation was cleared.

43 This is a very sensitive area, with remnant native vegetation among gorse and broom and a network of draining channels and wetlands. The approach used in the Rakahuri was deemed inappropriate, due to these sensitivities and so a large-scale, tractor-towed mulcher was used (Figure 12). Weed infested areas were targeted, whilst avoiding areas of indigenous vegetation (Figure 13, 14 and 15).

44 The operation was entirely delivered without the need for broadcast-application with herbicides.

45 The Department of Conservation had utilised a similar approach in the Ashburton Hakatere which was highly successful. One area above ‘blowing point bridge’ on the Ashburton Hakatere had been efficiently cleared by the same operator and in 2022, the area entirely reverted to active riverbed following high-river flows. In this Ashburton example, some herbicides were utilised on site, with extensive stands of female grey willow and alder lining remnant channels target-killed using drill and inject techniques. These targeted methods ensured that only the most problematic of pest species were killed. Specific, plant-by-plant kills were performed sensitively along the waterway margins.

46 The total cost of all works for Stoddard’s Island came to $690k, with $307,943 spent on mulching works. This equated to an average cost of $5,810.25 per Ha, noting that the vegetation densities varied dramatically at the site. Where vegetation densities were lower, clearance was performed at around $1200.00 per Ha.

47 In the coming season, maintenance of regrowing weed vegetation will be controlled either by re-mulching the cleared areas with the tractor-based machine or by spraying of regrowing woody weeds. The estimated cost of maintenance work is very hard to state as there is little precedent for works done in this way.

48 In my experience, using a mulcher to manage weed growth would not be a suitable option throughout Canterbury Rivers, but it is a viable option under certain circumstances.

Figure 12, the machinery used at Stoddard’s island: Tree shear (left), Tractor with attached mulching deck (centre and right).

Figure 13, mulch-cleared areas at Stoddard's island on the Rakitata river. Image captured following two weeks of work.

Figure 14, Mulch clearing on the ground at Stoddard's island

Figure 15, The final cleared extent at Stoddard's island on the Rakitata

Conclusion

49 The Rivers section at Environment Canterbury have trials novel approaches to weed control and indigenous biodiversity projects associated with flood protection. Whilst these projects have been successful, they are only possible in selected sites and are typically more expensive than regular weed control managed by using herbicides.

50 Environment Canterbury has established a team to deliver ‘Braided River Revival Whakahaumanu Ngā Awa ā Pakihi, which fundamentally integrates flood protection with habitat restoration, kaitīaki value and recreational activities.

51 These novel approaches add additional ‘tools’ to manage weeds and indigenous vegetation, but it is my view that a complete transition away from herbicides is not possible.

Dated 11 March 2024

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Gregory Stanley