

**BEFORE 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 resource 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 MELISSA SHEARER
ON BEHALF OF CANTERBURY REGIONAL COUNCIL (APPLICANT)**

11 March 2024

SUMMARY STATEMENT

This evidence I have presented outlines the description of the environments within which spraying occurs, including a description of sensitive sites, a description of the spraying activity, including methodologies and target areas, the practices and processes in place to ensure that all spray operations are carried out in the safest and most effective manner possible, and to demonstrate the compliance assurance processes within the spray operations.

The purpose of my evidence is to demonstrate an understanding and respect for the environments within which spraying occurs and to detail the operational practices to identify and avoid / minimise environmental effects.

Introduction

- 1 My full name is Melissa Elizabeth Shearer. I am employed as a Senior Environmental Advisor at the Canterbury Regional Council (**Regional Council / CRC**) and I have held this position since September 2016. I have been employed by the Regional Council since September 2011.

Qualifications and Experience

- 2 I have over 12 years' experience in Resource Management and Environmental Advisory.
- 3 I hold a Bachelor of Science with 1st Class Honors in Geography and Biology with an Endorsement in Environmental Science. My study focussed on natural earth processes and freshwater ecology.
- 4 Of relevance to this proposal, I have also completed Responsible Care New Zealand's HSNO Advanced training and hold a Growsafe Theory Certificate.
- 5 Prior to my current role, I obtained 4 years' experience in Compliance Monitoring, which included monitoring of the existing resource consents held by the Regional Council authorising the spraying activity.
- 6 My role within the Rivers Section is to provide objective advice and direction to operational staff regarding good environmental practice when carrying out flood protection and drainage maintenance works, including spraying.
- 7 I have responsibilities to ensure we are compliant with Resource Consents and Permitted Activity conditions along with Hazardous

Substances and New Organisms Act 1996 regulations and Health and Safety at Work Act 2015 regulations.

- 8 I have helped to establish the processes used to set up agrichemical discharge jobs, quality assure those jobs prior to delivery, I carry out site inspections to audit spray operations and compile data for compliance reporting purposes.
- 9 I was a contributing author of the Resource Consent Application and Assessment of Environmental Effects; my evidence is a summary of the key points of this AEE plus additional matters raised through the consent process this far.

Code of Conduct

- 10 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.
- 11 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

- 12 I have been asked to provide evidence on behalf of the applicant to inform resource consent applications to discharge agrichemicals and clear vegetation.
- 13 My evidence addresses matters under the following headings:
 - (a) Description of the environment;
 - (b) Description of the spraying activity;
 - (c) Commitment to reduce herbicide use through time;
 - (d) Work Planning and Delivery;
 - (e) Compliance with existing authorisations and requirements;

- (f) Proposed consent conditions, as relevant to my field of expertise.
- 14 In preparing my evidence I have reviewed the following documents:
- (a) The application and assessment of environmental effects;
 - (b) Three requests for, and their responses of further information;
 - (c) The submissions;
 - (d) The evidence of other CRC experts (staff and contracted advisors);
 - (e) The Officers S42A report including the evidence provided to support the Consent Planning Officer.
- 15 Such evidence is within my area of expertise.

Description of the environment *ref section 6 of AEE*

- 16 This section of my evidence provides a general description of the environments within which spraying occurs as set out within the AEE and succinctly described in the officers S42A Report.
- 17 Despite the application being sought to cover all waterways within Canterbury, the typically sprayed areas are those within dedicated flood protection or drainage schemes. These are the lower, highly modified reaches of rivers where modern land use demands requires protection from the effects of erosion and flooding. With the exception of the upper Waitaki Rivers, spraying is not routinely done in high country reaches or waterways classified as High Naturalness Waterbodies within the Canterbury Land and Water Regional Plan.
- 18 Occasional spraying may occur outside of these specified scheme areas where that spraying is for a specific environmental enhancement project or one-off flood/erosion risk management project. It is anticipated, there might be increased spraying outside of the currently established flood protection and drainage schemes (as described in the evidence of Mrs Leigh Griffiths, Mr David Aires and Mr Gregory Stanley). The spraying activity will still be occurring within the environments as described below.

Braided Rivers ref paras 166-171 of AEE

- 19 Braided rivers are a globally rare and unique landform, and only form in locations with a specific set of climatic and geological features. They are

highly dynamic and provide a diverse range of habitat types from open gravel bars, flowing braids, side springs, wetlands and terrestrial forests. Because of this diversity in habitats, these river types also provide home to an array of specialist plant and animal communities adapted to this often-harsh environment.

- 20 Braided rivers also come in a variety of sizes, ranging from small one to two thread channels such as the Ashburton Hakatere to the expansive multi-braid Rakaia.
- 21 The regular re-working of gravel bars, the changing positions of flowing braids and building and erosion of land is important for retaining the biodiversity within these rivers.
- 22 Within the braided river landscape, for management purposes, the terms **fairway**, which is the open gravel and actively flowing/braided section and the river **berms**, which are the stable vegetated corridors each side of the fairway.
- 23 The river berm is comprised of a mix of managed flood protection tree species (willow and poplar cultivars primarily), native vegetation, 'wild' weedy areas, side springs and wetlands. Berms also host recreational values such as walking tracks, river access, bike parks and horse riding facilities. In many schemes, but not all, the outer edge of the river berm is confined by earthen stopbanks. These stopbanks are engineered grassed banks that act as the last line of defence to contain floodwaters (see Mr Aires evidence).

Coastal sections of rivers [ref paras 172-173 of AEE](#)

- 24 Some of the riverine environments where spraying may occur overlaps with the Coastal Marine Area (CMA). The CMA within the river environment, as defined by the Resource Management Act, can extend up a maximum of 1km upstream of the mouth of the river.
- 25 The environment within this stretch is still characteristically riverine and may often not exhibit any truly coastal features aside from tidal water interchange.

Drainage networks [ref paras 178-182 of AEE](#)

- 26 Prior to agricultural development, the land area that the drainage schemes of Kaikōura, Halswell, Ashburton Hinds, Seadown and Clandeboye occupy were vast wetlands. Historically, these wetlands were progressively drained and channelised through the construction of the drainage channels we see today.
- 27 These waterways lower local groundwater and surface water levels to maintain land suitable for agricultural and urban land use.
- 28 These waterways are often uniform in shape, straight, with steep banks and silty bottoms and may either have year-round flows or dry seasonally. Some however have managed to retain natural cobbled bed material with pools and riffles and healthy flows and ecosystems.

Creeks and small waterways [ref paras 174-177 of AEE](#)

- 29 In a number of smaller schemes the managed waterway is a small single thread channel, which often has a smaller catchment, more consistent flow and a stable bed. Examples include the Halswell/Huritini, Lyell Creek/Waikao, Okana River and Washdyke Creek.
- 30 These waterbodies generally do not have wide vegetated berms, and many have stopbanks along their flanks within more densely populated areas.

Sensitive sites [ref paras 183-306 of AEE](#)

- 31 Whilst all waterway environments are sensitive, particular sites within various rivers have been identified to contain noteworthy values. This section of my evidence provides a broad description of the more sensitive sites within the river environments we carry out spraying. These sites require extra precaution and controls to be applied for spraying. Please refer to the paragraphs indicated within the AEE for further detailed information about these sensitive sites. The evidence of other experts presenting at this hearing also provide additional information about these sensitive sites.

a) Surface water intakes [paras 183 – 190](#)

- 32 There are a number of direct abstractions of surface water from braided rivers, small single thread rivers and drainage network watercourses. This

water is abstracted for a variety of end uses from irrigation to drinking water.

- 33 These abstraction points may be in the form of an open intake race and intake structure, infiltration galleries, or direct pumped takes.
- 34 There are also shallow wells (screened less than 20m deep) which are abstracting groundwater however due to their depth and proximity to the waterway many of these wells are hydraulically connected to the adjacent waterway and should be treated with the same precaution as a surface water abstraction for the purposes of protecting quality.

b) Drinking water intakes and protection zones (community supply) paras 191-198

- 35 For some communities, their drinking water is supplied from rivers or nearby groundwater wells and drinking water protection zones are set to protect the quality of water supplied.
- 36 Appendix 1 of the AEE sets out all of the drinking water protection zones and their associate take point which overlaps with areas that may be subject to spraying. Maps of these areas are available for this hearing.

c) Sites of significance to māori paras 292-298

- 37 All rivers/awa are of significance cultural importance to māori. There is a strong and historic connection with all waterbodies and the maintenance and enhancement of the mauri, or life supporting capacity, of wai māori is a central management principle for all of Ngai Tahu (Te Runanga o Ngai Tahu 1999).
- 38 Some waterbodies (including within coastal areas) have areas specifically identified for special significance such mātaimai, Taiāpure or Fenton reserves, silent files, nohoanga and statutory acknowledgements under the Treaty Settlement arrangements. Most waterbodies are also considered Wahi Tapu or Wahi Taonga and can be valued for mahinga kai and ara tawhito.
- 39 Marae and papakāinga drinking water supplies may also be located alongside or within rivers.

d) *Dwellings 299, Schools and Preschools 300-301 and Community amenity and recreational areas 302-306*

- 40 There are many houses that are located very close to the banks of rivers where spraying may be carried out across the Region. These are easily identifiable from aerial imagery and locations understood from existing operations.
- 41 Table 5 of the AEE (found on page 61) provides a summary of all of the schools and preschools that I have identified as being within 250m of a waterbody that may be subject to spraying.
- 42 Riverbeds within Canterbury provide significant recreational opportunities for local communities, with activities including fishing, horse riding, biking, walking, picnicking, bird watching, 4WD and trail biking. There are Regional Parks within braided rivers, and a large number of formal or informal campgrounds which have been highlighted in the AEE.

e) *Salmon, inanga spawning habitat, critical habitats of freshwater fish*

- 43 Salmon spawning habitat has been described in detail in [paras 284-286 of the AEE](#)
- 44 Inanga spawning habitat has been described in detail in [paras 231-234 of the AEE](#)
- 45 Critical habitats have been described in [paras 241-278 of the AEE](#)
- 46 These habitats have been afforded extra protection in the Land and Water Regional Plan and CRC holds existing resource consents to carry out operational works in those areas (excluding Critical Habitats, consent drafting in progress), including the existing consents authorising spraying.
- 47 While the consents held for salmon spawning and inanga spawning habitats (for reference, their consent numbers are CRC175009, CRC175010 and CRC175011) do not specifically address agrichemical discharges, they do have conditions to manage the effects of the *results* of chemical discharges – that being the removal of vegetation. These consents set out work practices and consultation requirements. Later in my evidence I have recommended that, if the decision makers consider it required, conditions are applied to any granted resource consents that reflect those already contained within this inanga and salmon spawning habitat suite for operational consistency.

f) Certified Organic farms/producers adjacent to rivers (not in AEE)

- 48 Organic farming was not identified as a sensitive site in the original AEE;
- 49 I currently do not have a comprehensive list of all producers following organic farming principles in Canterbury. There is however local knowledge of some operations adjacent to waterways that may be subject to spraying.
- 50 I note that (based on reviewing the BioGro and AsureQuality organic certification process¹) the onus appears to be on the producer to protect their property and goods from contamination from outside sources. For instance BioGrow certification requires annual testing of irrigation water when there is risk of contamination of water sources from the catchment (such as if there are conventional farming operations within the catchment). The AsureQuality certification process requires producers to notify their neighbours of their organic operation and must apply measures to avoid potential contamination such as applying buffer zones, physical barriers or to have processes in place.
- 51 None the less, I propose to build a database of organic operations to help inform spray planning and to assist in compliance requirements with the proposed condition to notify organic farming operations. This is detailed later in my evidence.

g) Wetlands

- 52 Wetlands are a biodiverse and highly sensitive environment and can form an integral part of river systems within or adjacent to locations of spraying operations (see Dr Jean Jack's evidence).
- 53 Later in my evidence (within Work Planning and Delivery planning section) I have noted how operational staff will identify wetlands via the use of an internal Wetland Identification Guide.

h) Long-tailed bat habitat

¹ Refer to the [BioGro NZ website](#) and [AsureQuality website](#) for further information,

- 54 In South Canterbury, there is an overlap with some flood protection scheme areas subject to spraying and habitat areas for long-tailed bats. CRC has mapped the following areas as potential roost habitat (figure 1):

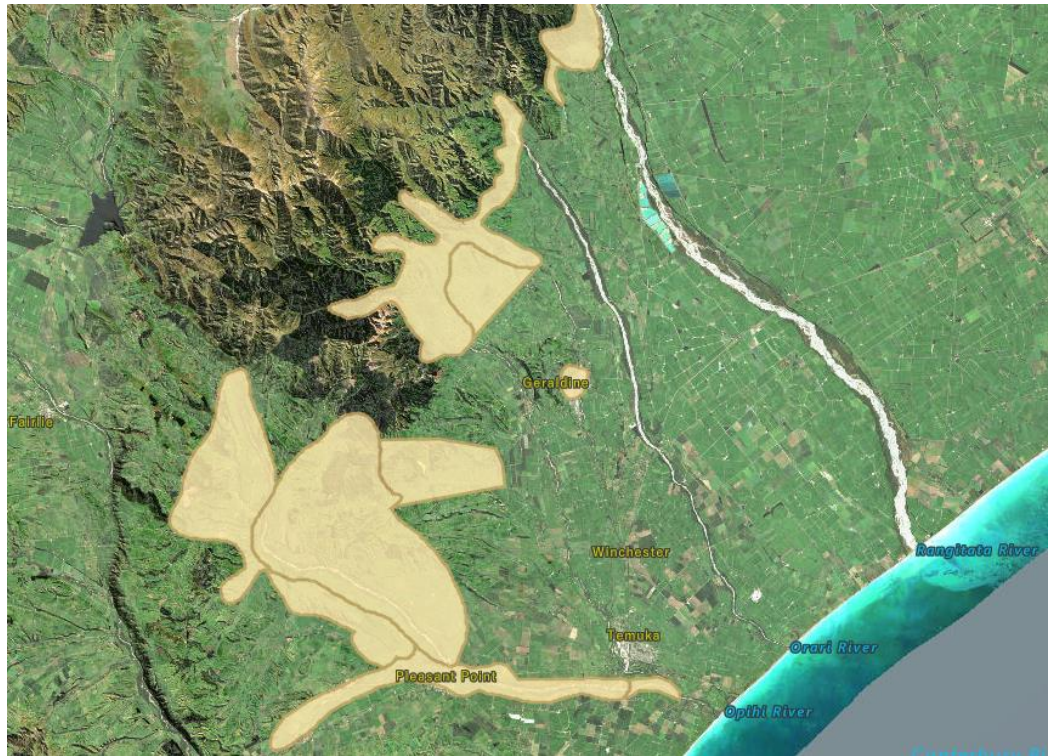


Figure 1. The brown shaded areas demarcate the known extent of potential long tailed bat roost habitat. Within this area are waterways managed as part of flood protection schemes. **Source:** ECan Maps

- 55 Within this broader habitat area there are trees known to be utilised for roosting, with a significant proportion of those trees being managed flood protection vegetation species (willow var. and poplar var.). The trees utilised for roosting are important flood protection trees within the river berms, and unless they pose significant safety risk, there is no operational reason for those trees to be damaged or removed. If there was a requirement to remove those trees, it would not be through being sprayed, with a mechanical approach most likely. As described in the Environmental Guide and Defences Against Water Code of Practice (both provided with my evidence for reference) preferred roost trees are often old, gnarly, split trees and are at threat of weed invasion and are susceptible to be overwhelmed, particularly by claiming vine weed species.

- 56 Flood protection operations within the long-tailed bat habitat area are undertaken in close collaboration with the Department of Conservation to ensure our activities do not have adverse impacts on the availability of roost habitat. Mr Greg Stanley in his evidence has also noted work done to enhance roost tree protection.

i) Indigenous vegetation within river beds

- 57 Both the evidence of Dr Jack and the Wildlands report appended to the s42A report provide a description of indigenous vegetation, including those classified as Threatened or At Risk, found within rivers and discuss the potential impacts of spraying on these plants.

j) beehives

- 58 Apiarists often utilise braided rivers for foraging grounds for honeybees. These areas are of particular significance in spring while willow, gorse and broom are in flower (Pers. Comms., Martin Lass on behalf of Canterbury Hub of Apiculture NZ, 2021).
- 59 Apiary sites are typically in the same locations year to year as bee keepers utilise existing sites with good access, however there may be mobility in their sites. As detailed later in my evidence, there is an established process for working with bee keepers to determine hive locations prior to spray operation, and there are existing operational conditions set to ensure impacts on foraging bees are minimised. This existing approach is endorsed by Apiculture NZ in their submission.

k) bird nesting habitat

- 60 As outlined in the evidence of the terrestrial ecology experts, riverbeds provide nesting habitat for many iconic and rare indigenous bird species, such as the wrybill/ngutu pare, banded dotterel / pohowera, black-fronted tern / tarapirohe and black-billed gull / tarāpuka.
- 61 All of these species require open gravel habitat within which to nest.
- 62 As the target areas for spraying within the rivers which these birds inhabit is densely vegetated islands, there is a low risk of disturbance to nesting activity through spraying. However, access to spray sites upon open gravels, or overhead aerial operations may disturb nesting birds. The risk is further reduced by timing operations to avoid the nesting season as far as practicable. This is a key driving factor for why aerial operations

currently do not commence before the start of February (noting the peak nesting season is generally accepted as 1 September to 1 February – refer to Dr Jacks evidence).

- 63 It is standard practice, and a proposed consent condition, to carry out pre-works surveys to identify nesting birds and to apply setbacks between the nesting activity and the operation. I personally have completed many years' worth of pre-works surveys and am very familiar with where birds nest and where they do not.
- 64 Dr Jack in her evidence outlines the process for obtaining an exemption from carrying out pre-works bird surveys and considers this appropriate for the spraying activity at hand. I agree with Dr Jack that this is an appropriate avenue for this application.

Description of the spraying activity *ref paras 30-95 of AEE*

- 65 Consent is being sought to cover all of CRCs likely agrichemical needs within rivers and their associated environments. This includes the needs to manage flood risk, carry out drainage maintenance, biodiversity protection and enhancement projects and for biosecurity.

Why CRC sprays ref paras 33-43 and the Evidence of David Aires

- 66 As explained in **David Aires** evidence, invasive and noxious weeds pose a significant threat to rivers and streams from both from a flood risk management and biodiversity threat perspective. Left unchecked, these weeds can and will completely dominate these river environments displacing or destroying existing habitat for native flora and fauna while at the same time drastically reducing flood carrying capacity, increasing erosion risk and significantly impacting on the natural character of Canterbury's unique river systems (Stecca et al., 2023).
- 67 Due to the large spatial extent of sites CRC need to manage for weed growth, techniques other than spraying can be physically and economically unviable. This makes agrichemical use the best option currently available in many circumstances.
- 68 Flood protection and drainage works are an important tool to keep people safe and protect assets and productive land in support of resilient communities and a strong economy. The infestation of weed on these

assets and within riverbeds and waterways threatens the integrity of the protection network and threatens environmental, social, economic and cultural values.

Spray methodologies ref paras 49-69 of AEE

- 69 There are different techniques available to apply agrichemicals depending on the spatial extent of the target area, the sensitivity of surrounding areas and limits on accessibility.
- 70 **Aerial Spraying via Helicopters**– carried out on larger rivers with large target areas to cover. This is performed by specialist contractors by qualified and experienced pilots. Helicopter aerial spraying can be either by spray boom or gun/wand depending on if it is spot spraying or blanket spraying on the target area.
- 71 **Aerial Spraying via Unmanned Aerial Vehicle (UAV)** – using a purpose-built specialist UAV (drone) to aerially spray areas. This technique is particularly helpful within the drainage networks where precise spraying is required, but access to the waterway by vehicle can be difficult (eg within sensitive arable farmland). Similar to helicopter spraying, the UAV contractors completing this work must hold a high level of qualification from the Civil Aviation Authority.
- 72 **Ground based knapsack or stump painting** – small scale spot spraying operation using a backpack knapsack or stump painting where very targeted applications are required such as around native planting sites, along stream banks or within drainage channels.
- 73 **Ground based truck or tractor mounted handheld spray gun** – application into areas where there is good driving access, and where targeted spraying is required such as along tracks and stopbanks, within drainage networks, on fairway islands and spot spraying weeds within flood protection vegetation. Spraying is done from a purpose-built spray rig mounted on a vehicle and delivered by handheld spray gun.

Target weed species ref Paras 47-48 incl. Table 2 of AEE

- 74 Table 2 (page 18 and 19) of the AEE covers a general list of target species within different target areas to provide an overview of the target weeds.

- 75 The target plants within braided river fairways can generally be described as woody or herbaceous weeds or tree species. These plants have the potential to bind river gravels together, trap silt or other debris and assist in the formation of erosion resistant islands. Typical targets include gorse, broom, lupines, false tamarisk and wilding trees like willow, pines, alders and wattles.
- 76 Berm and track spraying focuses on vine species that can grow up and overwhelm or smother flood protection vegetation such as Old Mans Beard, blackberry and ivy. Stopbank and drain bank spraying focusses on woody weeds like gorse and broom, willow or poplar seedlings whose roots can penetrate into the bank potentially causing a point of weakness within the bank structure (refer to Mr Aires evidence).
- 77 Drainage channel spraying focuses on emergent macrophytes that grow excessively to the point where the entire water column is occupied by the plant, thus reducing the flow carrying capacity of the waterway. Typical targets include monkey musk, water cress, and canary grass.
- 78 For clarity, it is not proposed to create a target species list rather the above descriptions and those within the AEE provide a general overview of species likely to be subject to control via spraying.

Timing, duration and frequency of spraying [ref paras 70 -81 of AEE](#)

- 79 There is no set prescribed timing or frequency for completion of spraying. It is assessed on a site by site, season by season, year by year basis and only carried out when assessed to be required, environmental factors have been accounted for and weather conditions on the day are favourable. Depending on the scale of the weed problem, spraying could be done once per year, or a repeated application may be required. Spraying may also only be required intermittently with a several year gap in between.
- 80 Varying factors contribute to the amount of weed growth in any given year on braided rivers. One key factor is whether or not there have been significant flood events. High energy flood events can naturally clear out weeds.
- 81 Within drainage scheme areas, driving factors behind weed growth include nutrient loads, water temperatures, sun light and whether or not the waterway runs dry at times. Given these systems tend to be more

stable with consistent inputs (in terms of flows, and nutrient loading) spraying is more predictable and required on a routine basis. The extent of the growth (ie how infested a waterway becomes) is the main variation from season to season.

- 82 Spray operations are timed to minimise the potential harm of spraying, however there are numerous competing values that must be considered, including fishing seasons, bird nesting season, peak bee foraging and low summer flows along with when plants will take up the chemical effectively and timing of flood events. Based on my research and knowledge of these values, I have developed the below 'spray calendar' to identify these competing values and attempt to determine when is or isn't preferable for spraying to occur (Figure 2).

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
Growing season(s)												
Flood season(s)*												
Low river flows												
Bird nesting												
Inanga spawning												
Peak bee activity												
Fishing season **	General											
	Salmon											
High recreation												
Preferred spray months												

* Flood seasonality will vary river to river, assess your local rivers

** Please double check your local F&G Region regulations for the current Financial Year, the open season may vary year to year, and specific rivers and different target species may have different open seasons. What is listed above is the most common open season across the region

Figure 2: Spray calendar used in job planning to determine optimal timing for spray operations.

- 83 To determine when to spray a specific area, the spray calendar, spray handbook and stakeholder feedback is considered and a preferred time is selected based on a balance of the relevant values, the tools available to

mitigate any impacts on these values, combined with the need for spray to be effective. The timing will differ depending on the broad environment being considered (e.g. braided rivers, small waterbodies, drains) and the specific values relevant in a specific location (e.g. inanga spawning does not occur in all locations so is not always relevant). In general, spraying occurs during the following timeframes:

a. **Braided rivers - fairway:** spray operations are generally carried out in late summer, early autumn (Feb - April). In some cases, a spring spray is required.

b. **Drainage networks:** typically done annually between October and March, as these systems are more stable (i.e. do not have flood events that clear weeds) and tend to have recurring excessive weed growth each year. Maintenance of drainage networks must occur prior to winter when the drains need to be fully functioning. Specific timing is based on the overall spray program (the networks are extensive, and maintenance cannot possibly occur all at once) and any site-specific values (e.g. inanga spawning).

c. **Stopbank, berm and track maintenance:** is more likely to occur throughout the year as these areas are generally significantly setback from water and usually not as limited by the competing values discussed above.

Agrichemicals and adjuvants to be used [ref paras 82-95 of AEE](#)

84 The proposal is to continue the use of herbicides with **glyphosate** (broad spectrum herbicide for targeting annual and perennial broadleaf weeds) and **triclopyr** (general purpose brush weed herbicide for targeting woody weeds) as the active ingredients, along with **adjuvants** (additives to the spray mixture that enhance the performance of the herbicide including surfactants, penetrants, drift reduction agents, dyes and markers, antifoam agents).

85 An independent review into the substances currently in use was completed during the drafting of the AEE, with the intention of this review to confirm (or otherwise) that these substances are the most fit for purpose for our use or to identify if there were more suitable substances available on the New Zealand market. This review has found that the products currently in use are the most fit for purpose, and there are no better alternatives available (better in the context of effectiveness, cost,

environmental risk and health risk). The Agronomist (David Gill) who completed this review has presented his findings within his evidence.

- 86 An outcome of the review was also to change the terminology specified within the conditions from *surfactants* to *adjuvants*. The term adjuvant better reflects the suite of additive substances that are included within herbicide mixes to improve their uptake into a plant. Many (but not all) spray additives, irrespective of their mode of action, are approved under the same Group Standard (HSR002503 – Additives, Process Chemicals and Raw Materials (Subsidiary Hazard) Group Standard 2020). This means the same controls are applied to the substances irrespective of whether or not they are technically classified as a penetrant, surfactant, drift reduction agent or antifoam agent. Therefore, there is no material change in the management required of spray additives by specifying *adjuvants* rather than *surfactants* on any replacement resource consents. Notwithstanding that, all products are thoroughly reviewed prior to use to determine if there are any specific measures required for its application. This review includes reading and following the EPA conditions of approval (substance controls), product Safety Data Sheet and Product Label.
- 87 I further note that one type of adjuvant used by the applicant are spray oils, which are not classified as a hazardous substance.
- 88 In addition to specifying glyphosate and triclopyr based herbicides, the AEE requested to allow for the use of any Environmental Protection Authority (EPA) approved products. This will allow CRC to keep up with any changes in national regulations around agrichemical use and ensure the CRC can adapt and deploy new agrichemicals that may become available that have a lower health and safety or environmental risk than herbicides currently in use. This will ensure CRC is consistently operating at best practice for agrichemical use irrespective of duration of consent.
- 89 I note that the EPA has a detailed thorough assessment and approval process for hazardous substances, and it is their role and responsibility to ensure that hazardous substances approved for use within New Zealand do not, on balance, pose unacceptable harm to the natural environment and people. It is my role and responsibility and that of CRC operators to ensure that the conditions of the EPA approval are followed when using hazardous substances.

Controlling drift

- 90 An integral part of all spray operations is ensuring that the risk of spray drift is minimised. This is to avoid adverse effects on water quality, air quality, non-target plants, pollinators and other river users and to ensure excessive chemicals aren't used and resources wasted.
- 91 Spray drift management is relevant for all application techniques (except stump painting) but has most pertinence for aerial application methods, including helicopter and UAV application.
- 92 I have addressed how CRC plan and deliver spray operations to ensure all health and environmental risks associated with spraying are minimised later in my evidence, but considered it important to highlight specifically the measures regarding drift management at this point in my evidence given the extra attention this topic has received during the consent application process thus far.
- 93 Below I have set out the requirements that apply to all spray jobs, which are set out in the Spray Handbook, that specifically seek to control drift risk:
- (a) Auditing a proposed spray location prior to any operations beginning to identify any sensitive locations where spraying should be avoided, or parties notified. Sites where aerial spraying, or any other method with a higher risk of spray drift, will be avoided include:
 - iii. Within 250m of any schools, dwellings, marae or established camp grounds
 - ii. Where spray drift may affect organic farms
 - iii. Where spray may drift over flood protection vegetation, over water or into non-target vegetation
 - (b) Spraying must only occur under favourable weather conditions (wind conditions and forecasted rain) when the risk of incidental drift over water or washing of chemical off treated area is minimised.
 - (c) Operators to actively monitor wind speeds throughout the spray operation using a hand held wind meter. Cease spraying when wind conditions are likely to cause spray to drift outside of the target area. Current guide windspeed of 10kph (noting the proposal is seeking to increase this limit to 15kph).

- (d) Spray when wind is blowing away from sensitive sites such as open water or non-target vegetation.
 - (e) Adjust spray droplet/nozzle size of spray apparatus and pressure of spray release to suit conditions to minimise spray drift (aim for as coarse droplet size as possible while following manufacturers recommendations for spray coverage for efficacy).
 - (f) Add spray drift reducing adjuvant to tank mix when conditions require.
 - (g) For aerial applications, minimise the height of discharge as far as is safely practicable (as judged by the professional opinion of the pilot on the day depending on vegetation heights and other river bed hazards such as power lines).
 - (h) Apply set back buffers (no spray zones) between application area and surface water as guided by the findings of the SCION report. I note these findings are being presented by **Dr Brian Richardson** in his evidence.
- 94 I have provided a copy of the most up to date versions of the Spray Handbook with my evidence.
- 95 It has been recommended within the Expert Advice of Dr Ranger to the Consent Planner that the two versions (internal and contractor) of the Spray Handbook be combined into one. I disagree that this is the best approach for our operations. Upon reading the Spray Handbooks it can be seen that the internal version outlines the full process that goes into establishing a spray job, I believe this detail is irrelevant for a contractor to have to hand. What is most important are the controls that must be strictly adhered to on site, hence why I created a separate Contractors version to ensure that these controls are front and centre, and not lost in excessive information.

Commitment to reduce herbicide use through time *ref section 5, paras 143-161 of AEE*

- 96 I acknowledge and appreciate the views within our community, including of those who took the opportunity to submit on these consent applications, relating to the use of agrichemicals in waterways. I note both the opposition and support for the use of agrichemicals as a weed management tool from the submissions.

- 97 I also acknowledge the fundamental opposition of mana whenua to the use of herbicides in waterways, and respect this position. Te Mana o Te Wai must be a fundamental guiding principle in our decision making and operational practices where they may impact on water quality and the actions of the CRC in delivering spray operations must ensure there is no further degradation of water.
- 98 I recognise the uncertainty of the full effects on herbicide use (owing to lack of studies nationally and internationally) and accordingly encourage a precautionary approach to herbicide use in such important and sensitive environments (those sites specifically highlighted above as ‘sensitive sites’).
- 99 Ultimately the chemicals used and proposed to continue to be used in their concentrated form are classified as ecotoxic (to varying degrees and for various organisms) and also have potential health effects, particularly for those using the chemicals.
- 100 As part of my role, I seek to drive change and to reduce the reliance on herbicides through time. However, I recognise that use of this tool cannot stop overnight, rather there needs to be the ability to transition to other methods where possible.
- 101 These methods and pathways to achieve this will be set out in the proposed “Agrichemical Strategic Management Plan” which was proactively put forward as a condition of replacement consent (ref para 156 to 161 of AEE for further detail on this proposed Management Plan). **Mr Greg Stanely’s** evidence talks about some possible alternative methodologies for weed control at the scale we are needing it to be undertaken in.

Impacts of climate change on Canterbury’s rivers [ref paras 144-150 of AEE](#)

- 102 With the advice I give as part of my role, I must consider the impacts of climate change when making decisions about long term waterway management, to ensure our actions today put future generations in the best position possible to deal with the effects of what is to come.
- 103 The ability for rivers, particularly braided rivers, to naturally manage the extent of weed growth within their beds depends on the frequency and severity of flooding. I note the points raised in some of the submissions

about leaving rivers to naturally deal with weed infestations through their natural flood regimes.

- 104 Based on the February 2020 NIWA report prepared for Environment Canterbury “Climate change projections for the Canterbury Region”, the following climatic conditions impacting on future flood regimes are likely under the range of climate change scenarios analysed in that study;
- a) Changes to annual rainfall of $\pm 5\%$ are projected for most of the region with the largest increases projected to occur in winter with 15-40% more rainfall in many eastern, western and southern parts.
 - b) The number of snow days reduces everywhere with the largest reductions in high alpine areas.
 - c) Drought potential is expected to increase
 - d) Mean annual discharge generally decreases by mid-century. By late century mean discharge tends to increase along eastern areas with decreases for some inland areas.
 - e) Mean annual low flow generally decreases, with decreases exceeding 20% in many areas of the region
 - f) High flow changes are expected to be variable across the region, with both increases and decreases projected,
 - g) Floods are expected to become larger for many parts of Canterbury, with some increases exceeding 100%. However there are some pockets of little change or decreasing Mean Annual Flood levels.
- 105 As an overall summary, flood events on alpine fed rivers are likely to be more severe, while more pronounced periods of drought will severely affect the flow regimes of the hill fed or lower plains waterways.
- 106 Coupled with a change in flood regimes, climate change presents an opportunity for new weeds to invade our waterways and existing weeds to be more prolific (Sheppard et al 2016).
- 107 The ultimate outcome of these potential climate change effects is both a need to have effective “tools in the toolbox” to continue to manage problematic weed growth, while also having a long-term view that whilst weed growth may intensify, flood severity is likely to increase in some of the larger braided rivers thus reducing the need to intervene to keep their beds clear.

Work Planning and Delivery *ref Section 3.7 paras 96-102 of AEE*

- 108 This section of my evidence provides a description of how spray operations are planned and delivered to minimise the risk of environmental or human health harm. As mentioned, I have set up much of this process and ensure its delivery.
- 109 Within a flood risk management context, the staff delegated management responsibilities for flood protection or drainage schemes are CRC Rivers Area Engineers. The Area Engineers determine works required to maintain these schemes to set performance standards, to ensure that they operate effectively and as designed during flood events to meet community expectations and ensure community safety.
- 110 Spraying is only utilised when the spatial extent and density of infestation is such that other alternative or manual methods will be too time consuming, labour intensive or costly to complete.
- 111 When it has been determined that spraying is the most appropriate method for control of a weed infestation, then a detailed job planning process is followed to ensure that risks (from an environmental, operator and public safety and asset protection perspective) associated with that operation are identified, and steps put in place to manage those risks and minimise any potential effects. The Area Engineers are supported by Senior Environmental Advisors and Senior Communications Advisor in this process.
- 112 Spray planning and risk identification is guided by the following:
- a) Canterbury Regional Defences Against Water and Drainage Schemes Code of Practice*;
 - b) Rivers Section Environmental Guide*
 - c) Current consent conditions;
 - d) Spray Handbook (internal and contractors versions)*
 - e) Conditions of EPA and HSNO approval on specific substances;
 - f) Agrichemical label requirements
 - g) searches of GIS databases for mapped ecological information and locations of sensitive sites within spray reaches
 - h) the outcomes of consultation and engagement with iwi and stakeholders on proposed spray operations.
 - i) the 'spray calendar' for timing
 - j) site inspections (on foot or aerial inspections) to determine extent of weed growth and identify sensitive sites or habitats to avoid.
 - k) local knowledge of our staff

- l) Environment Canterbury's internal wetland ID guide (this has been completed since lodging these applications)*.
- m) as proposed in our AEE, the Strategic Spray Management Plan will also form part of this suite of guidance material.
- n) The proposed organic farming operations database - a database of organic operations that we will map and work with in the future through notifications, alternative weed control methodologies, setbacks etc

*A copy of the Code of Practice, The Environmental Guide, updated Spray Handbooks, and the Wetland Identification guide have been provided as attachments to my evidence for reference. These are provided to illustrate the type and extent of information available when planning a spray job. They are internal working documents and not intended to be fixed in time, attached to a resource consent or available externally.

- 113 Consultation with key parties (such as local Rūnanga, DOC and F&G office and bee keepers) occurs prior to each spray programme being delivered with the intended outcome of this consultation being the identification of any particular sensitive areas, times of year or other operational practices that need to be accounted for when delivering the spray programme. This consultation comes in the form of face to face meetings/hui, targeted email or phone correspondence, three monthly proposed work reports (sent monthly) and the provision of the annual proposed spray report as required by the current consent conditions.
- 114 After consultation has been carried out, notification of works commencing is also given to these parties along with the wider community. This may be in the form of social media posts, advertisements in local news papers, discussions with our rating district representatives and property owners where the spraying occurs, content on the Environment Canterbury website and emails out.
- 115 For publicly accessible spray locations, signage is always put up at the common access points to the reach of the river being treated and a process is in place to stop work if approached by members of the public or other river users.
- 116 A dedicated environmental plan is produced for every spray operation, which sets out how the spraying will be done to comply with consent requirements and good practice. The Environmental Plan and Job Sheet (internal staff delivery) or Statement of Works (contracted staff delivery) for the operators on site turn all of the legal requirements and expectations into workable, understandable, practical conditions. **Paragraph 102** in the AEE sets out some examples of the conditions we apply. I believe the

Operations Management Plan as proposed by the Consent Planner is aligned with this existing job planning/documentation.

- 117 A copy of a recent Contractor Statement of Works, Environmental Plan Notice of Operations and Standard Operating Procedure for a fairway spraying job on the Lower Hinds River has been attached to my evidence to provide a real-life example of the outcome of the planning and preparation process to demonstrate what the operators see on site.
- 118 A Spill Response Plan is in place and applied to all operations. It was noted in the Wildlands technical evidence report (see point 12.1.1) that it appears CRC does not hold such a Plan for its operations, this is incorrect. A copy was provided with the AEE.
- 119 All staff and contractors hold the required qualifications for spray operations, which includes (for staff) Growsafe Standard, for contractors they must be Registered Chemical Applicators, and for aerial applications the CAA specified qualifications and ratings. Staff also receive supplementary environmental training to raise their awareness and understanding of the wider values found within rivers.
- 120 Importantly too, all staff employed are working in their own local area. This means they have a connection to their community, have excellent local knowledge of their rivers and their users, and themselves and their families hunt, fish, swim and enjoy their local rivers so have a deep respect for the environments they are working in.

Compliance with existing authorisations and requirements

- 121 Given this application is to reauthorise an activity that has been occurring in Canterbury for a number of decades, I am able to demonstrate CRCs systems and processes to ensure compliance with the existing authorisations.
- 122 This section addresses specific compliance matters including our process for self-assessment/auditing, the annual reporting I complete and the data CRC gathers on their operations.

Self-assessment

- 123 Overall resource consent compliance and coordination of water quality sampling, compliance reporting and practice improvements sits with myself as the Senior Environmental Advisor.

- 124 All operations, whether carried out by CRC employees or contractors, are overseen by the local Area Supervisors and the Senior Environmental Advisors who conduct regular internal site audits to ensure we operations are following all requirements. This is in addition to any Compliance Monitoring carried out independently of our section by the Resource Management Officers employed by CRC.
- 125 A part of my role is to thoroughly investigate any complaints or queries received regarding spray operations or resource consent breaches. I identify learnings and ensure those learnings are communicated and implemented throughout all spray operations to ensure there is continuous improvement. I have included additional information below regarding the processes followed when issues are identified.

Annual Reporting

- 126 The current consent conditions require the following reporting to be completed:
- a) A Proposed Plan for Herbicide Application at least once per year. The Proposed Plan must identify the areas for spraying in the coming year, the proposed dates, herbicides to be used and methods of application. This must be provided to listed parties by the 1st August each year.
 - b) A Completed Spray report must be provided to CRC Compliance Monitoring by the 31st May each year which provides the detail of spray operations that have occurred over the previous 12 months, which must include the area of operation, type and amount of chemical used, spray methodologies, dates of operations and the results and analysis of any monitoring that has taken place.
- 127 It has been proposed to continue with this reporting regime (with slightly amended dates for better operational alignment).

Data gathering - Water quality monitoring results

- 128 Water quality monitoring is carried out across the region and targets spray operations in a mixture of larger braided rivers and drainage network waterways. This is to ensure CRC are sampling a representative spread of spray operations. At present at least 6 sample sets are collected from river spray operations, and 6 from drain spray operations. It has been

proposed in the application to sample at least 6 sites, consisting of 3 rivers and 3 drains annually.

129 I note at present the costs associated with processing each water sample are as follows:

- Glyphosate \$424.67+GST
- Triclopyr \$159+GST

130 We have records of our water quality monitoring data dating back to 2005. A full copy of the water quality results (current up to 8/3/2024) are available as an attachment to my evidence.

131 Of this record (a total of 83 sampled rivers or drains) there are 5 samples that have identified an exceedance of the consented limit for **glyphosate** (0.1mg/L). I have included these results below for reference:

10/3/2015 – Chatterton River – 0.86mg/L
 16/4/2015 – Clandeboyne Drain – 1.8mg/L
 14/2/2019 – Ashburton River North Branch – 0.23mg/L
 15/1/2020 – S1 Drain - 0.15mg/L
 13/10/2020 – Donehue Drain – 0.17mg/L

132 The evidence of Marta Scott sets out the international standards for health and drinking water for glyphosate (as New Zealand has not set such a standard). The WHO health based value for glyphosate is 0.9mg/l, while the US EPA has set a drinking water standard of 0.7mg/L. The Chatterton River and Clandeboyne Drain samples are in excess of these international standards, whilst the others remain below.

133 In regard to the results for **triclopyr** sampling completed to date, there have been no exceedances for triclopyr against the current limit specified on the existing resource consents (that being 0.01g/m3). The highest residue concentration detected was 0.0095mg/l recorded on the Ashley Rakahuri following the extensive spraying operation carried out as part of the river revival project detailed in Mr Stanleys evidence.

134 Of the 24 samples taken for triclopyr, residues above the detection limit of the laboratory test were found in 9 samples. The detection of residues, albeit below current consent limits, raises doubt around the ability for the operations to comply with the proposed limit of zero detection in the

proposed condition set. I have commented on this further later in my evidence in my evaluation of the proposed conditions.

- 135 As noted by Ms Scott, the MAV for Triclopyr for drinking water in New Zealand is 0.1mg/l, while the Land and Water Regional Plan sets a limit of 0.05mg/l. All of the samples collected for spray operations are below both the MAV and LWRP limit.
- 136 If residues are detected above the limits specified on the resource consent, the following steps are taken to firstly ensure there are no potential effects ongoing from the exceedance and then to investigate the potential causes so that lessons can be learnt and applied across all operations regionally. I note that this process is guided by the existing requirements of the resource consents held.

Process steps:

- Conduct search of GIS downstream of spray area to identify any drinking water supplies (public or private) that may be impacted by the breach (within 1km downstream). Notify the owner of any supplies found within that reach.
- Advise the Compliance Monitoring Section that a breach has been detected and an investigation is underway. Confirm they will be provided with the outcome of the investigation.
- Advise the Area Supervisor that residues above the consent limit have been detected, to arrange to have the pre-spray sample processed immediately. Confirm all spray operations have ceased.
- Obtain copies of spray diaries to determine mixing rates, weather conditions etc noted on the day
- Obtain copy of the Environmental Plan and Job Sheet/Contractor Statement of Work to review on the job instructions.
- Check past river flows
- Interview operators to determine if they can recall any particular site conditions, or any issues with the operation that may have caused an exceedance (such as extent of weed growth, windiness of the day, observations of what was occurring on surrounding farmland at the time).
- Obtain current site photos or conduct a site visit to determine current state of the spray reach and any visible signs of damage to flora or fauna.

- Formulate findings, learnings and corrective actions and create investigation report.

- 137 The results of the investigation are reported to the Compliance Monitoring Section and outcomes/learnings applied across the whole regions operations.
- 138 If formal complaints are received by CRC regarding the spray operations, it is often a requirement of my role to investigate those complaints. I generally follow the same process as for water quality limit breaches to identify whether or not the operations were being carried out in a manner that is not consistent with our resource consents, spray handbook, environmental plans to determine if the complaint is warranted and genuine. I note I generally do not investigate informal complaints aired on social media, however as an organisation CRC do endeavour to provide information and answers to questions raised on that platform.

Data gathering - GPS tracking

- 139 In addition to water quality monitoring data, GPS tracking data is collected for some of the spray operations (not all operations are kitted out with GPS tracking, however this is something CRC are working on adopt in the near future).
- 140 The GPS tracks are a valuable tool to demonstrate where spraying has or hasn't been completed, and can be used demonstrate the targeted nature of the operation. Two snips from the GPS tracks for aerial spraying on braided rivers are included below (Figure 3).
- 141 Other data is also included with the GPS tracks from aerial operations includes the date and start/finish time of operation, target weed species, chemical and additive name, mixing rate and volume used, the boom width, nozzle flow and spray height, and wind speed and direction.



Figure 3. Screenshots from Environment Canterbury's GIS system showing the GPS tracks of an aerial spray operation on the North Branch Rakaia River (top) and the Rakaia River mainstem (bottom). The lines represent the flight path taken by the helicopter and records only when spray is discharging from the boom. Source: ECan Maps, Data supplied by helicopter operators.

Data gathering - Spray diaries / daily spray logbooks

- 142 Every spray operator must also complete their daily spray diary / logbook. The information captured on their spray dairy includes:
- a) Operators names
 - b) Date
 - c) Start and finish time of application
 - d) Location
 - e) Target Plants
 - f) Chemicals and additives used
 - g) Mixing rate and mixing location

- h) Total quantity of chemical used
- i) Application method
- j) Weather conditions, including wind speeds, rain

Comments on conditions

143 My comments below relate to the proposed set of conditions provided to the Hearing Panel as an Appendix to the Section 42A Officers Report (dated 26/2/24). My comments are focused on the operational or potentially unintended consequences of these conditions and their enforceability/ability to be monitored from my perspective and experience.

144 I have also reviewed the recommended conditions presented in Ms Jolene Irvine's evidence which I believe provide cover the intent of the s42A reports recommended conditions set, while remedying operational and compliance concerns.

Condition 2 – this condition specifies that “The discharge must only be of agrichemicals registered for use in or onto water, or onto land where it may enter water, under the Hazardous Substances and New Organisms Act 1996 (HSNOA), or any successor legislation.” I consider this condition to be overly restrictive, given not all herbicide use is into water therefore there is no legal requirement for all herbicides used to be “aquatic approved” (that being having the control variation that states that clause 52 does not apply). Further, based on my investigation into the matter, the EPA does not appear to specify approvals for substances to be applied onto land in situations where it may enter water (checked with EPA via email) therefore compliance with this condition is not possible.

Condition 3 – This condition specifies the substances approved for use under the proposed consents. Aside from the misuse of surfactant terminology and the use of ‘proprietary formulations’ as addressed in Ms Irvines evidence, a fundamental issue for agility of future operations has been the omission of the proposed process to adopt new EPA approved substances. I am of the view that having the ability to incorporate nationally approved and regulated substances through a prescribed, transparent process as proposed in the AEE proposed conditions is appropriate and operationally necessary. Otherwise CRC is potentially hamstrung into using less than desirable substances (that being those with potentially higher environmental or health risk) or left with a significant gap in our ‘toolbox’ should one of the currently specified herbicides no longer hold approval for use in New Zealand.

Condition 4 – This condition requires CRC to immediately start using “any amine-based formulation of triclopyr” that is approved for use in New Zealand. This requirement is concerning. There appears to be no consideration given to the chance of there being other physical, environmental or human health effects associated with an amine-based triclopyr which are materially more significant than ester based. For interest, I have compared below the hazard classifications

of two triclopyr products that have been approved in New Zealand – Garlon 360 (Triclopyr Triethylamine Salt) and Grazon (Triclopyr butoxyethyl ester) (Figure 4). I note it appears Garlon 360 was approved for use as an aquatic herbicide as a trial but does not appear to be currently available on the New Zealand market for use.

Garlon 360 (amine based / TEA)	Grazon (ester based / BEE)
Flammable liquids Cat 3	Acute oral/dermal/inhalation toxicity Cat 4
Acute oral/dermal/inhalation toxicity Cat 4	Eye irritation Cat 2
Skin sensitization Cat 1	Skin sensitization Cat 1
Specific target organ tox – single/repeated exposure Cat 2	Hazardous to the aquatic environment acute/chronic Cat 1
Corrosive to metals Cat 1	Hazardous to Soil Organisms
Serious eye damage Cat 1	Hazardous to terrestrial invertebrates
Hazardous to the aquatic environment acute/chronic Cat 1	
Hazardous to Soil Organisms	
Hazardous to terrestrial invertebrates	

Figure 4. Comparison of two formulations of Triclopyr products to demonstrate the different hazard classes applied to each of these substances. The hazard class refers to the nature of the hazard the substance possessed (eg corrosiveness, explosiveness, flammability, ecotoxicity) while the Category (Cat) number refers to the severity of the hazard. The lower the category number the more severe the hazard. **Source:** Corteva Agriscience NZ Limited SDS for Grazon™ and Garlon™ 360.

Based on the above comparison, Garlon has the same degree of ecotoxicity as Grazon but has different and more severe human health effects. It should therefore not be expected that CRC instantly require staff to use a substance that is more hazardous to their health. Further, Garlon is highly flammable and corrosive to metals, which Grazon is not. This poses further storage compliance requirements and safety concerns which should be a matter for consideration.

In summary, I do not support the requirement to instantly start using the first available amine-based triclopyr product that becomes available on the New Zealand market.

Condition 5 – I accept and support the intent of the condition, which is clearly to keep the most aquatic ecotoxic substances out of water (both surface and groundwater). Operationally this condition imposes significant restrictions, particularly if “surface water body” is defined as the space between the banks of a waterbody and not just the open/pooled/flowing water. This would unnecessarily restrict triclopyr use in areas such as stopbanks, high islands within rivers and along stream banks where it is necessary to be used. I also believe it will be difficult to determine compliance with this condition given the depths to ground water are spatially and temporally variable in rivers and lands adjacent.

Condition 10 – My first point of concern with this condition is the requirement for the ‘Manager’ to **Certify** the Annual Programme for Agrichemical Discharge”, however there is no certainty around what Certification means or timeframes within which this must be completed. I believe this Annual Programme should be supplied to the ‘Manager’ but not for certification.

Secondly, I acknowledge the intent of the Habitat Restoration Plan as specified in clause e of this condition. My main issue with this requirement is interpretation of “habitats and riparian planting areas which have been damaged or removed..”. As raised within the Wildlands Terrestrial Ecology Evidence, removing any unwanted weed growth could be considered removing habitat as inevitably some animal or insect communities will be occupying those areas (even if they are unwanted pests). An application of this requirement would be to replant a weedy braided river island which is counter productive to what this proposed consent is seeking to achieve. Similarly, the HRP is expected to detail planting to ‘offset’ areas of weed growth with native planting in other areas, this is just not a realistic expectation. I believe a more appropriate requirement would be to create a planting plan which can be utilized in areas where progressive planting is proposed to reduce the areas for herbicide application into the future.

Condition 16 – Public notification of annual spray programmes within *newspapers*. I do not believe this is a practical or necessary requirement. The proposed spray programme report as produced under our current resource consents is currently a 30 page document. It is therefore practically more appropriate to advertise this on the ECan website. Any notices in the news paper would just refer to the website. I also believe it is more appropriate to carry out wider notification of the spray programme closer to the actual dates of application to ensure that the public have timely information about the operations. This is achieved through the other targeted notification conditions.

Condition 20 – requirement to produce an Operations Management Plan. I note that (with some new additions proposed by the CP) it is already an existing practice to produce an OMP (although we call this our Job Sheet or Contractor Statement of Work). I have provided a copy of a real life Job Sheet / SOW as an attachment to my evidence.

Condition 23 – specified qualifications for operators. This condition requires “at least one person at each discharge of agrichemicals to be a Growsafe Registered Chemical Applicator (RCA) or be a “registered herbicide applicator”. Firstly, I note that requiring CRC staff to be RCA is over and above what is legally required in the HSNO Act and HSWA Act. Secondly, there is no such qualification as a ‘registered herbicide applicator’. All **contractors** are required to be RCA however CRC staff must hold qualifications as ‘persons other than a contractor’. This has been confirmed by Growsafe Specialist Training Manager. I note condition 22a also already and more accurately addresses the qualification requirements. I recommend this proposed condition 23 is deleted.

Condition 26 – I support the intent of this condition, however have concerns over the interpretation, practicality and enforceability of this condition. The restriction on mixing or cleaning within 10m of land containing a subsurface drainage system is too difficult to determine compliance with, it is unreasonable to expect staff to know with any certainty what land is being drained by subsurface drainage. Similarly, depth to groundwater is spatially and temporally variable so at any

given moment it would be difficult to determine the exact depth of groundwater at the location of mixing. I believe it is more appropriate to focus set backs from visible surface water (including flowing channels, springs, wetlands, pools) and wells and to ensuring mixing is done in a manner that ensures accidental spillages cannot enter the ground or water in the first instance (such as over an impermeable mixing surface).

Condition 33 – I support the intent of this condition in order to protect quality of irrigation and stockwater, however recommend some amendments to aid in operational practicality. Firstly, the restriction should only be applicable to active intakes (ie those in use), there are intakes on waterways that are inactive and not pumping water (such as during the off season or during irrigation restrictions) therefore it is an unnecessary restriction to prevent discharges upstream of those. Secondly, there should be an avenue to manage aquatic weed closer to active intakes should the owner of that intake agree. It is often in their best interest to have a clear, open waterway upstream of their intake. Finally I note that the proposed restricted area has been extended to 250m upstream and 100m downstream for direct surface water discharges. This is an extensive setback and is significant in terms of operational impact and the overall effect of that on the schemes functionality.

Condition 34 – A rescoping of this condition is required, I believe it should only be relevant to drinking water wells and not all abstractions, as per evidence of both Marta Scott and Neil Thomas.

Condition 35 – I consider the restriction on aerial discharge within 250m of “..roof, or any other structure used as a catchment for water supply” to be difficult to comply with and an unreasonably large setback. It is unreasonable to expect CRC to know where and when someone may be using any number of unknown structures to collect water. Further ambiguity is added by use of “water supply” without any scope or definition.

Condition 37 – While I respect the need to protect culturally significant areas within and surrounding rivers, the implication of this condition is that we could not spray anywhere. Many or all rivers or waterways we propose to spray under this consent application are culturally significant. As Jolene Irvine has discussed in her evidence, this is the trigger for requiring a consent in the first place.

Condition 38 – I accept the intent of this condition, to protect bees and pollinators (and their commercial products) from the effects of herbicide. However compliance with this condition is not possible with how it is worded. The condition requires that no discharge onto plants in flower may occur unless there is evidence published that the **mixture** has **no effect on fauna**. The unworkable requirement is ‘no effect on fauna’. I have reviewed a number other similar broad spectrum herbicides on the market and all hold ecotoxic classifications for a range of terrestrial and aquatic fauna. I recommend retaining the applicants proposed wording for this condition.

Condition 40 - From an operational and compliance perspective, this condition is not workable. It is too restrictive and would have significant impacts on the CRC’s ability to maintain the flood control and drainage scheme assets and to manage biosecurity risks. Further, the condition is too ambiguous as there is no definition of edible plants (this could be interpreted as edible by humans or other animals and insects). For the commonly consumed edible berries found within

the environments sprayed (such as blackberry) the other control methods set out in the proposed conditions (such as notification and signage) seek to ensure the public are aware of the risks of consuming wild foraged berries within managed areas and I consider this more appropriate than a blanket ban on spraying.

Condition 42 – CRC hold a suite of resource consents that allow for flood protection works to occur within Inanga Spawning Habitat (see CRC175009, CRC175010 and CRC175011 on the CRC website for further details). These consents follow an “avoid where ever possible” process. When that work does need to occur, such as for emergency works or works that legitimately cannot be completed outside of the spawning season, then monitoring and provision for rehabilitation or offsetting apply. All works must be carried out in accordance with an Inanga Management Plan. For operational consistency I recommend adopting a similar approach to herbicide application in those areas. It is my opinion that this approach both enables urgent or emergency works to occur while providing protection for the spawning habitat.

Condition 43 – I do not agree with this condition requiring no herbicide discharge within trout habitat and note that pre-lodgment engagement with Fish and Game (the statutory managers for sports fish and their habitats) did not request CRC avoid spraying in salmon spawning or trout habitat. All of the matters raised during pre-lodgment consultation with Fish and Game have been addressed in other proposed consent conditions. The condition is excessively restrictive and poses significant operational restrictions. The LWRP identifies significant reaches of rivers as salmon spawning habitat, but no such mapping exists for trout habitat or trout spawning habitat. As Dr Duncan Gray has noted in his evidence, trout are ubiquitous across Canterbury and are in no way threatened in terms of their distribution or numbers. There are other proposed conditions that achieve protection of water quality, and therefore supersede the requirement for this condition. I note too that the resource consents CRC175009-11 also authorize CRC river works within Salmon Spawning Habitat.

In regard to the inclusion of non-migratory *galaxias* species within this condition, I note the non-migratory *galaxias* species in Canterbury include: Alpine galaxias (Naturally Uncommon), Bignose galaxias (Nationally Vulnerable), Canterbury galaxias (Declining), upland longjaw galaxias (Nationally Vulnerable), lowland longjaw galaxias (Nationally Endangered) (Dunn et al 2017). Upland longjaw, lowland longjaw and bignose galaxias are all species included within the “Critical Habitats” list of the Land and Water Regional Plan, and as noted consent is being sought to approve CRC activities within this Critical Habitat. None the less, given all of these species have a conservation threat classification to some degree I agree that there should be no spraying direct to water within the habitat mapped as Critical Habitat in the LWRP for these non-migratory *galaxias* species. I am supportive of a condition worded to this effect.

Condition 44 – I agree with the intent of this condition, but suggest it needs to be simplified. I find the prescribed number of passes allowed depending on extent of weed cover confusing and do not see what outcome this is seeking to achieve. This condition should also be strengthened by specifying that only aquatic approved herbicides may be discharged directly over water.

I suggest the following simplified condition is more appropriate:

"There must be no direct discharge of agrichemicals to water unless that agrichemical is approved for use as an aquatic herbicide and the discharge is for the treatment of emergent aquatic macrophytes. All practical measures must be taken to avoid discharging agrichemical over open water"

Condition 45 – I agree with the intent of this condition and the importance of protecting what little long-tailed bat habitat remains. However, I am concerned for the (perhaps) unintended consequences of this condition. Firstly, protecting roost trees from weed encroachment is vital, losing the ability to control vine weed species around these trees is likely to result in a loss of the tree too. Secondly I am concerned about the contradiction in conditions where reference to spraying before or after sunrise is made (such as regarding protecting pollinators). Delaying the time of day spraying may occur is also more likely to push operations into less favourable wind conditions, and therefore exacerbate the risk to long-tailed bats, their roost habitat and their prey species. I suggest an alternative approach to protecting long tailed bat roost habitat is necessary.

Condition 46 – I have no issue with this condition, other than to reiterate that the likelihood of spraying any large standing trees within the long tailed bat roost area is extremely remote. From a flood risk management perspective, all large trees within the berm areas within this habitat area are a significant asset for their schemes, and unless those trees are posing a significant health and safety or stopbank integrity risk then they would not be damaged or removed.

Condition 47 - I am supportive of a process to risk assess the likelihood of nesting occurring based on a set of criteria already established and in use by CRC for other river bed activities. Only where there is a risk of birds being present should it be necessary to survey. Based on my own 10+ years experience in surveying for and observing nesting braided river birds, I believe this is more effective at protecting nesting birds whilst also ensuring spray operations can be delivered (noting the benefit to nesting habitat through weed cover reduction). This position is also reflected in the evidence of Dr Jack and in the applicants proposed condition set (that being to include the exemption criteria).

Condition 48 – I believe this condition is too prescriptive and difficult to comply with, inherently setting CRC up to be non-compliant with any granted resource consent. This is primarily relating to the requirement to sample from certain areas, where the other consent conditions specify spraying must not be carried out within. A further example is that the condition states one site must include a wetland area, but there is no consideration given if CRC do not spray within a wetland in any given year (which is a very likely circumstance given CRC avoid spraying within wetlands as a first priority approach). From a practical perspective my preference is for a condition to specify that samples must be taken from a representative spread of river and drainage environments, with a focus on waterways with high aquatic value as a priority. For clarity, my use of representative relates to the hydro/geomorphological conditions of a waterbody such as ensuring a mixture of drainage type / lowland / hillfed / alpine fed rivers are sampled, rather than just all alpine fed rivers.

Condition 50 – Dr Gray in his evidence has talked about the issues with this requirement from a scientific design perspective (see point 84-86 of his evidence). I concur with Dr Grays evidence also from a compliance perspective. This condition as worded is too ambiguous and difficult to determine compliance

with. I agree with the intent of the condition (assuming that is to better understand the effects of herbicide use on aquatic benthic invertebrates) but do not believe the condition as written will provide any meaningful or clearly demonstrable evidence as to the impact of herbicide use. It also does not provide for any follow up actions or requirements thus making it effectively a redundant condition and should not be imposed.

Condition 51 – I do not believe this is necessary and appropriate to require the upstream/prior to spray sample to be analysed each time, given those samples are testing the background nature of the spray environment and not the spray operation itself. It is an appropriate step in understanding any elevated residue results that should only be activated should elevated residues be detected. This is the current approach in the current consent conditions and is also supported by Dr Gray.

Condition 52 – I agree with the process outlined in this proposed condition, with the exception of the requirement to take another full set of water quality samples (for reference that is (as currently proposed) one from an area upstream of what was sprayed, one immediately downstream of the area sprayed and one downstream of the area sprayed within 2 hours after the spraying stopped). I do not believe a second set of samples is going to provide any relevant information. Typical delays between taking samples and receiving the results from the laboratory is up to 2 weeks. Given the operation sampled for would have been completed on the day of the sampling, there would have been no agrichemical discharge (authorized by this proposed consent) carried out for up to two weeks prior. Therefore, sampling does not provide any indication of ongoing impacts of that initial agrichemical discharge, thus making this requirement superfluous. I believe this is the case based on the relatively low level of residues detected in sampling done to date under the existing consents, and the level of dilution experienced from river flows over time. However, I do also acknowledge the potential for leaching into surface water or groundwater overtime particularly if there has been significant rainfall or flood flows to wash over the sprayed surface, which may be picked up by delayed repeated sampling. Despite this I still doubt that this repeated sampling would provide insight into the original exceedance which is the point of the condition.

Condition 54 – as noted previously, the sampling for triclopyr undertaken has identified the presence of triclopyr residues, but at levels at varying degrees lower than the current limits prescribed on the existing resource consents. I acknowledge the evidence presented by various experts that triclopyr is acutely toxic to the aquatic environment, however I am unable to identify a justification for why a level of 0.01g/m³ is tolerated for amine based formulations, while no residues are allowed for ester based formulations. I would like to see further examination of the toxicology information for each substance type to demonstrate that having any residues of the ester version is likely to have an actual adverse effect on aquatic life, particularly at the levels of residue we are finding with the existing operations. The condition has proposed is ultimately setting CRC up to be non-compliant from the outset of any granted consents being given effect to.

Condition 55 – I am supportive of daily spray diaries being kept that are in accordance with the NZ Standard for Agrichemical Discharge. The requirements of this condition go above and beyond this Standard and I believe are unnecessary for the operator level. This is in specific reference to requiring the

operators to confirm parties have been notified and their responses and confirming compliance with the requirements for water sampling. The responsibility for these matters sits outside of our operators role and responsibilities but will be done by the relevant staff as I have explained earlier in my evidence. I also reject the requirement for the daily log to record that chemical containers used have been triple rinsed and appropriately disposed of – simply because they may not use a whole container in an operation. This is excessively prescriptive and managed by requirements outside of the resource consent (such as the NZ Standard). In addition, CRC is currently in progress for updating the spray unit infrastructure to enable GPS tracking of ground based spray operations. This is a significant investment and we require time to roll this out therefore we are unable to immediately comply with the requirement of this proposed condition for the daily log to keep a spray track log.

Condition 56 – I agree with the intent to keep a register of complaints regarding spray operations as these can be important sources of information to improve spray practices going forward. This condition however requires some clarity in the scope of complaints, adding ‘formal complaints’ would greatly assist with this. There are a large number of people, particularly on social media, who ‘complain’ about agrichemical use which could be interpreted as complaints that need to be recorded as per this condition. It is not constructive or practical to record those complaints as we would not have the information on the complainant or the specific situation they are complaining about.

As an additional general comment regarding the requirements to consult and notify with a wide range of parties for the numerous different management plans and reports under the proposed conditions, I fear that this is adding significant workload and burden on those parties, who may not necessarily have requested such involvement. This is feedback I have had from some recipients, whereas the majority of recipients do not respond to the information sent. CRC, for all of its operational flood protection activities, extensively consult and engage with these parties, however there is typically little to no engagement back. Some of these parties have expressed concern over the significant workload and difficulties meeting the needs of CRC in relation to the current level of consultation and engagement. I believe it is necessary to ensure that those parties listed under the proposed conditions actually do want to be involved in the processes that the proposed conditions are imposing on them.

Conclusion

- 145 CRC, through delivering its flood protection and land drainage functions, carry out significant spray operations in particularly sensitive waterway environments.
- 146 The evidence presented demonstrates that this is acknowledged and taken into account with decision making and job planning for all spray operations to ensure that potential adverse effects on human health, cultural values, recreation, water quality, terrestrial and aquatic ecology are minimised as far as practicable.

147 It is my role to maintain environmental bottom lines while balancing operational delivery. As such my evidence has focussed on how I do this under the existing consent frame work, and particularly with reference to my condition comments, and has outlined the issues I perceive with delivering this balance under the framework proposed through the draft conditions, should these consents be granted.

Dated 11 March 2024



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Melissa Elizabeth Shearer

References:

Dunn, N., Allibone, R., Closs, G., Crow, S., David, B., Goodman, J., Griffiths, M., Jack, D., Ling, N., Waters, J., & Rolfe, J. 2017. Conservation status of New Zealand freshwater fishes. Department of Conservation. ISBN 978–0–478–851467–3 (web PDF)

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Sheppard, C., Burns, B. & Stanley, M. 2016. Future-proofing weed management for the effects of climate change: is New Zealand underestimating the risk of increased plant invasions? *New Zealand Journal of Ecology*: **40(3)**: 398- 405.

Stecca, G., Hicks, D.M., Measures, R., & Henderson, R. (2003). Numerical modelling predication of vegetation trajectories under different flow regimes in New Zealand braided rivers. *Journal of Geophysical Research: Earth Surface*, 128.

Te Runanga o Ngai Tahu 1999 Te Runanga o Ngai Tahu Freshwater Policy Statement

Attachments:

Canterbury Regional Defences Against Water and Drainage Schemes Code of Practice

Spray Handbooks (Internal and Contractor) March 2024

Contractor SOW, Enviro Plan and SOP Hinds Spray

Rivers Section Environmental Guide (internal only)

CRC Wetland ID Guide (internal only)

CRC Water Quality Sample record (internal only)