UNDER THE RESOURCE MANAGEMENT ACT 1991

IN THE MATTER of an Application by Killermont Station Limited to take and use water to irrigate land in the Upper Waitaki catchment

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STATEMENT OF EVIDENCE BY RUTH GOLDSMITH ON BEHALF OF KILLERMONT STATION LIMITED

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1. INTRODUCTION

1.1 My full name is Ruth Johanna Goldsmith. I hold a BSc. (Zoology, 1998), a Postgraduate Diploma (Wildlife Management, 2000), and a PhD (Zoology, 2004) from the University of Otago. I am a member of the New Zealand Freshwater Sciences Society.

1.2 I am an Associate Environmental Scientist at Ryder Consulting Limited, an environmental consulting firm based in Dunedin. I have been employed at this firm since February 2004.

1.3 During this time I have undertaken studies throughout New Zealand examining the effects of human activities on freshwater ecosystems, including municipal sewage discharges, industrial discharges, gravel extractions, water abstraction, and water augmentation.

1.4 I have considerable experience with irrigation schemes and have previously undertaken ecological assessments on a number of existing and proposed schemes in the Otago and Canterbury regions (e.g. Shag River, Hakataramea River, Hurunui River). I have surveyed many streams and rivers throughout rural areas of New Zealand including watercourses on several other large farms in the Mackenzie Basin.

1.5 I have read and agree to comply with the Code of Conduct for Expert Witnesses in the Environment Court Practice Note (2006).

1.6 My evidence today addresses the following matters relating to the resource consent applications lodged by Killermont Station Limited:

(i) The existing aquatic and avifauna ecological values supported in the Ahuriri River, Manuka Creek and Frosty Gully in the vicinity of the proposed (and existing) Killermont Station water takes;

(ii) The existing aquatic and avifauna ecological values supported in the area to be irrigated;

(iii) A description of any potential aquatic and avifauna ecological effects associated with the developments;

(iv) A description and assessment of potential mitigation options, including those recommended in the Farm Environmental Management Plan

(GHD 2009), to address any potential aquatic or avifauna ecological effects.

2. BACKGROUND

2.1 I undertook a survey of water quality, and macroinvertebrate and fish communities in the Killermont Station area on the 22nd to 23rd of September 2009, focusing on the following watercourses; the Ahuriri River, Manuka Creek and Frosty Gully (Figure 1). At the same time Ms Marcia Dale (also of Ryder Consulting) undertook inspections of the same areas to assess bird habitat values.

2.2 Other information on water quality, macroinvertebrate fish and bird distribution has been obtained from a variety of sources and is acknowledged in the appropriate places. I have used this information to aid me in my assessment of potential effects.

2.3 I consider each of the four proposed irrigation takes and schemes in turn.

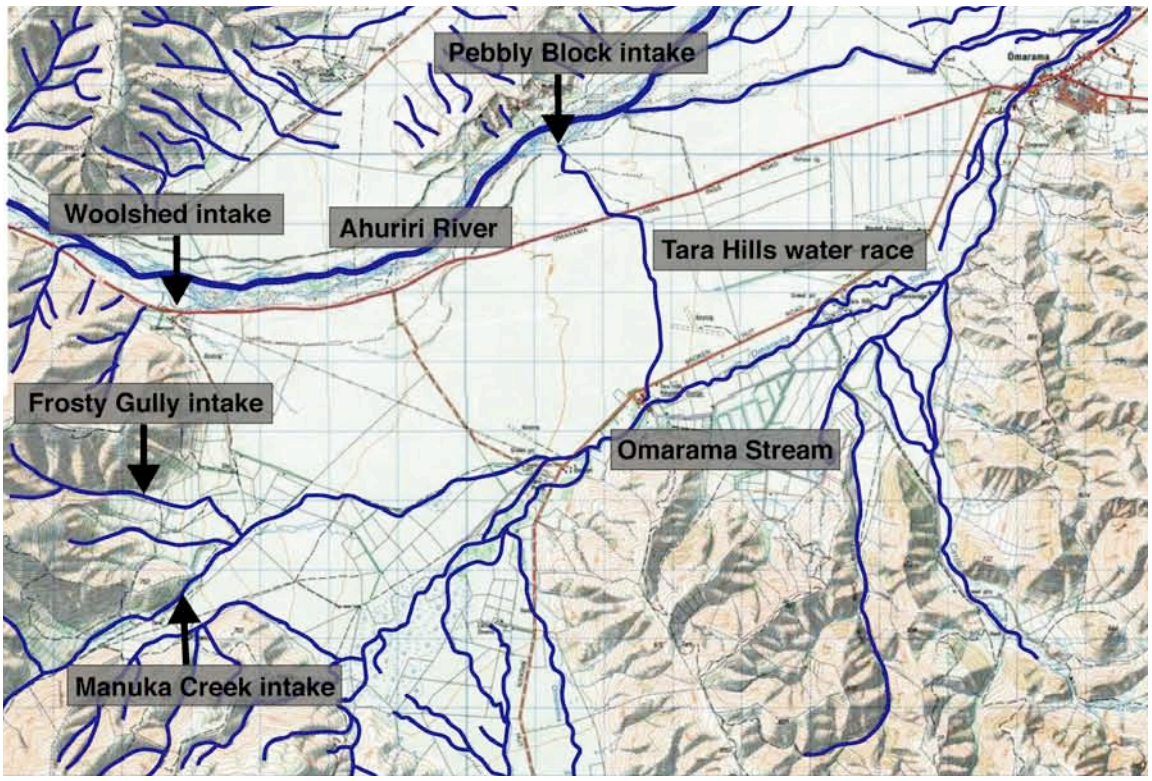

Figure 1 *Map of Killermont Station showing location of irrigation takes.*

3. AHURIRI RIVER - WOOLSHED SCHEME AND PEBBLY BLOCK

3.1 Proposed irrigation

3.2 The irrigation proposal includes two separate water takes from the Ahuriri River, referred to as 'Woolshed Scheme' and 'Pebbly Block'. For the Woolshed Scheme a buried gallery type water intake and a pumping station will be constructed in the bed of the Ahuriri River (Figure 2). For the Pebbly Block a screened pipeline take will be constructed within an existing diversion channel (length approximately 500m) of the Ahuriri River (Figure 3). This diversion channel currently conveys water to the Omarama Station (pipeline) and Tara Hills Station (water race) intakes.

3.3 The proposed Woolshed Scheme water take from the Ahuriri River is 175l/s, giving a total volume of 1,680,000m^3/year. A buried pipeline will convey water to irrigate up to 300ha on Killermont Station (centre pivot and K-line irrigators). There are no watercourses along the pipeline route or within the proposed irrigation area. The proposed Pebbly Block water take from the Ahuriri River is 100l/s, giving a total volume of 1,209,600m^3/year. The water will irrigate up to 216ha (K-line irrigators), surplus irrigation water will be discharged back to the Ahuriri River. The Tara Hills Station water race flows through the Pebbly Block irrigation area. No irrigators will cross over the race.

3.4 Existing aquatic and avifauna ecological values

3.5 A National Water Conservation Order (WCO) was placed on the Ahuriri River in 1990, recognising its outstanding wildlife habitat, fisheries, and angling features. The WCO prescribes the maintenance of river flows within certain ranges, restricts both the right to dam or take water from the river and its tributaries, restricts the granting of resource consents where they may affect the provisions of the Order, and establishes a set of minimum water quality and water quantity standards to protect the natural characteristics of the river. The proposed irrigation takes from the Ahuriri River must comply with the requirements of the WCO.

3.6 The invasive algae *Didymosphenia geminata* (Didymo) was first identified in the upper Ahuriri River in 2007. I observed during my survey that Didymo is present at both of the proposed intake locations in the Ahuriri River. Other diatom

growths and long green filamentous algae (>2cm long) were also present at both sites (Appendix One, Table 1).

3.7 Macroinvertebrate communities in the Ahuriri River generally have high taxonomic diversity and are dominated by high quality *Deleatidium* species mayflies (Meredith *et al.* 2003, Coffey 2009). I found that community health indices were indicative of 'excellent' biotic health in the vicinity of the proposed Woolshed Scheme intake and 'good' biotic health[1] at the proposed Pebbly Block intake diversion (Appendix One, Table 2).

3.8 Five freshwater fish species have been recorded in the Ahuriri River in the general vicinity of the proposed Woolshed irrigation take (New Zealand Freshwater Fish Database and my survey). Three native species, Canterbury galaxias, koaro and upland bully, and two introduced species, brown and rainbow trout have been recorded. The Ahuriri River is known to support a highly valued sports fishery, and brown and rainbow trout are also present in the vicinity of the proposed Pebbly Block take. None of the three native fish species identified in the vicinity of the Woolshed take are classified as rare or uncommon (according to the Department of Conservation's current threat classification system, Hitchmough *et al.* 2007). Other species have been recorded in the Ahuriri River several kilometres downstream of the intake, including alpine, bignose and lowland longjaw galaxias, longfin eel and common bully.

3.9 The Ahuriri River is recognized as an important habitat for rare and uncommon bird species, in particular the black-fronted tern and grey duck, which are listed by the Department of Conservation as 'Nationally Endangered' and the falcon, which is listed as 'Nationally Vulnerable', although these species are unlikely to be present on land destined for irrigation. Previous surveys of the wider Ahuriri River area found the area provides important feeding, roosting and breeding habitat for many key bird species, including black stilt, black-fronted tern, wrybill, banded dotterel, black-billed gull, marsh crake, Australasian bittern, Australasian shoveler and New Zealand scaup (DOC 2004, Daly 2004).

3.10 The Tara Hills water race is used for irrigation and to supplement flows in Omarama Stream. The water race has a flow of approximately 500l/s and does

[1] 'Excellent' and 'good' are narrative terms used to provide information on the quality of aquatic habitat based on the semi-quantitative macroinvertebrate community index (SQMCI) (Stark and Maxted 2004).

not flow continuously; because of this it has only minor value for aquatic communities.

Figure 2 *Ahuriri River in the vicinity of the proposed 'Woolshed Scheme' irrigation intake.*

Figure 3 *Left: Existing diversion of the Ahuriri River to the existing Tara Hills and Omarama Station intakes. Right: Location of proposed 'Pebbly Block' irrigation intake, at the existing Tara Hills and Omarama Station intakes.*

3.11 Potential effects on aquatic and avifauna ecological values and mitigation

3.12 Water take

3.13 As required by the Ahuriri River WCO, no abstraction or diversion from the river may occur when the minimum flow requirement is not exceeded (refer to evidence of Mr Ian McIndoe).

3.14 The Woolshed Scheme irrigation intake will consist of an infiltration gallery buried beneath the bed of the Ahuriri River. Good practice guidelines for fish

screening in Canterbury (Jamieson *et al*. 2007) acknowledge that, if well designed and maintained, gallery intakes are effective at screening a wide range of fish sizes. A screened intake pipe is proposed for the Pebbly Block Scheme. The proposed screen has a mesh size of 2mm, and is rotating and self-cleaning (KleenScreen™). Good practice guidelines for fish screening in Canterbury (Jamieson *et al*. 2007) indicate that this mesh size is sufficiently fine to exclude most larval native and salmonid fish species, including non-migratory galaxiids. I therefore consider that if the recommended guidelines are followed, effects on fish communities as a result of the intakes will be less than minor.

3.15 Construction

3.16 Local aquatic communities in the Ahuriri River could be disturbed during construction of the water intakes. Macroinvertebrates within the Woolshed Scheme intake gallery area will be directly removed during excavation and some fish (e.g. juvenile trout) and fish eggs may also be removed. However, more mobile fish species and life history stages (e.g. adult trout) will be able to move to avoid the excavation area. Suspended sediment levels downstream of the excavation area will increase, reducing water clarity in the short-term. Flushing of these sediments will occur during river freshes following construction. Clarity in the Ahuriri River is naturally low during freshes and the snow thaw season. Less disturbance is expected during the installation of the Pebbly Block pipeline intake. I recommend that intake construction take place outside the peak trout spawning and rearing season (approximately June-October) and best practice guidelines to reduce sediment inputs to watercourses during construction should be followed (e.g Environment Canterbury's Erosion and Sediment Control Guidelines (Environment Canterbury 2007)). Following construction, macroinvertebrates and fish will recolonize the area (within four to eight weeks), and I therefore consider the effects of construction to be short-term and minor in nature.

3.17 The potential spilling of contaminants from machinery into the river is also a possible risk associated with instream construction activities, but providing contractors work to appropriate construction and environment management plans this risk can be minimized. Plans should include requirements to clean machinery between waterways to prevent the spread of Didymo.

3.18 Intake and pipeline construction may result in some local disturbance to birds due to noise and removal of some riparian vegetation. However, the existing

habitat is already highly modified and provided vegetation removal is minimal and limited to the area necessary to construct the intake I expect that construction effects on birds will be short-term and minor. It is recommended that the Department of Conservation is consulted prior to the removal of any large trees, and that construction of water intakes takes place outside the peak of the main avifauna breeding season (August to December).

3.19 Discharge

3.20 Surplus irrigation water from the Pebbly Block will be discharged at a maximum rate of 100l/s back to the Ahuriri River (via the existing diversion bywash channel), approximately 1km downstream of the proposed intake. The intake water is sourced from an existing diversion of the Ahuriri River (approximately 500m upstream), and any surplus water will be returned to this diversion, which then flows back into the Ahuriri River. There is no reason to suspect that the quality of the water within the diversion differs markedly from that of the Ahuriri River main channel, as there are no land use activities that might contribute contaminants to the diversion channel, and I therefore do not anticipate this discharge to adversely affect downstream aquatic communities in the Ahuriri River.

3.21 Irrigation

3.22 Irrigation of Pebbly Block will be used to grow pasture and forage crops and no stock will be grazed in the area. Solid dairy effluent will however be imported to the farm and spread as needed according to nitrogen requirements (GHD 2009). The only waterway within the Pebbly Block irrigation area is the Tara Hills water race. It does not flow continuously and consequently has only minor value for aquatic communities. Surface runoff to the race is expected to be minimal due to the permeability of the soils and generally flat topography (GHD 2009). I therefore recommend that a 3m riparian buffer be maintained between the race and the irrigated area.

3.23 The Pebbly Block is located along the true right bank of the Ahuriri River, however the proposed irrigation area is set back at least 200m from the river and as the area will not be used for stock grazing fencing of the river is not required.

3.24 There are no waterways within the Woolshed Scheme irrigation area.

3.25 Any irrigation and subsequent pasture and crop production is likely to be beneficial to the main bird species that are currently found within the proposed irrigation areas (e.g. greenfinch, chaffinch, skylark). However, irrigated pastures may also attract Canada geese, which can cause fouling of waterways and pasture. Monitoring of the Canada geese population (in consultation with Fish and Game) is therefore recommended on irrigation land adjacent to the Ahuriri River.

3.26 Irrigation may deter rabbits and result in a reduction in their local abundance. This could potentially result in mammalian predators (e.g. cats, ferrets and stoats) switching to alternative prey, such as birds. Monitoring of mammalian predators is therefore recommended in areas adjacent to the Ahuriri River (in consultation with the Department of Conservation), and if necessary the implementation of an appropriate pest management strategy.

4. MANUKA CREEK

4.1 Proposed irrigation

4.2 A new buried gallery type water intake is proposed to be constructed in the bed of Manuka Creek (Figure 4). I note that consent for the construction of this intake has recently been granted.

4.3 The proposed water take from the creek is 37l/s, giving a total volume of 450,000m^3/year (over a six month irrigation season). A minimum flow of 65l/s will be maintained in Manuka Creek immediately downstream of the intake (equivalent to the 5-year 7-day low flow).

4.4 A buried pipeline will convey water (gravity fed) to irrigate up to 75ha on Killermont Station (centre pivot and K-line irrigators). There is already an existing irrigation take from Manuka Creek at this point, via a water race, which is used to irrigate 41ha. The pipeline will cross under Frosty Gully near its confluence with Manuka Creek. There are no watercourses within the proposed irrigation area.

4.5 Existing aquatic and avifauna ecological values

4.6 Manuka Creek is a small stream sourced from springs and snowmelt (GHD 2009). The creek channel is largely unmodified and it follows a relatively

straight course down a small valley, and then meanders across the basin flats on the southern boundary of the proposed irrigation area to its confluence with the Omarama Stream.

4.7 The upper reaches of the creek, above the proposed take location are generally flowing, however downstream of the proposed take the creek flows underground. At the time of my survey this occurred approximately 1km downstream (Figure 4). Only during extreme flood events does it have surface flow to the confluence with Omarama Stream (GHD 2009).

4.8 The creek channel is currently unfenced from stock and the riparian vegetation is modified, consisting mostly of pasture grasses, although there are remnant patches of matagouri and native shrubs in the upper reaches.

4.9 Growths of long filamentous algae (>2cm long) and diatom mats were observed in places in the vicinity of the take (Figure 5) (Appendix One, Table 1). The main species observed (Ulothrix) is known to form blooms on the beds of clean, cold, stony streams in spring and late summer (Biggs and Kilroy 2000, Moore 2000). No Didymo growths were observed.

4.10 Dissolved oxygen levels are high in the creek and conductivity and water temperatures are low, indicating good water quality. I also found that macroinvertebrate communities in Manuka Creek in the vicinity of the take have high taxonomic diversity, are dominated by high quality *Deleatidium* species mayflies, and are indicative of 'excellent' biotic health (Appendix One, Table 2).

4.11 Surveys in Manuka Creek by DOC (2004) and my own recent survey found that small brown trout (length range 56-160mm) are present in the vicinity of the take.

4.12 Bird species identified in an area of matagouri scrub near the vicinity of the proposed intake and in the broader irrigation area included blackbirds, introduced finches, black back gulls, magpies, hawks, silvereyes, skylarks, starlings and paradise ducks.

Figure 4 *Left: Manuka Creek at proposed intake location. Right: Manuka Creek approximately 1km downstream of proposed intake location, where the creek flows underground.*

Figure 5 *Filamentous green algae in Manuka Creek at the proposed intake location.*

4.13 Potential effects on aquatic and avifauna ecological values and mitigation

4.14 Water take

4.15 A minimum flow of 65l/s will be maintained in Manuka Creek immediately downstream of the intake (equivalent to the 5-year 7-day low flow). This minimum flow meets the requirements of the Waitaki Catchment Water Allocation Regional Plan (WCWARP), which was considered by an Environment Canterbury appointed hydrologist (Mr David Stewart, given the hydrological information available) to be more appropriate than applying the flow requirements of the Ahuriri WCO. As the minimum flow will meet the requirements of the WCWARP (refer to evidence of Mr Ian McIndoe) I consider that the minimum flow will ensure that the existing aquatic ecological values of the creek are protected.

4.16 The Manuka Creek irrigation intake will consist of an infiltration gallery buried beneath the bed of the creek. Good practice guidelines for fish screening in Canterbury (Jamieson *et al*. 2007) acknowledge that, if well designed and maintained, gallery intakes are effective at screening a wide range of fish sizes. I consider that if the recommended guidelines are followed, effects on fish communities as a result of the intake will be less than minor. I note that brown trout are the only fish species present in this creek, and they are possibly preventing the establishment of native fish species.

4.17 Construction

4.18 As I have already discussed above for the Ahuriri River takes, local aquatic communities in Manuka Creek could be disturbed during construction of the water intake. I recommend that intake construction take place outside the peak trout spawning and rearing season (approximately June-October) and best practice guidelines to reduce sediment inputs to watercourses during construction should be followed (Environment Canterbury 2007). Following construction macroinvertebrates and fish will quickly recolonize the area (within weeks), and I therefore consider the effects of construction to be short-term.

4.19 To minimize the potential spilling of containments from machinery into the creek contractors should be provided with appropriate construction and environment management plans, which include requirements to clean machinery between waterways to prevent Didymo being spread.

4.20 Intake and pipeline construction may result in some local disturbance to birds. However, the existing habitat is already highly modified and provided vegetation removal is minimal it is expected that construction effects on birds will be short-term and minor. It is recommended that the Department of Conservation is consulted prior to the removal of any large trees, should this be necessary, and that construction of water intakes takes place outside the peak of the main avifauna breeding season (August to December).

4.21 Irrigation

4.22 The Manuka Creek irrigation scheme (116ha) will be used to grow pasture for sheep and beef grazing (not dairy); 41ha of this area is already irrigated. The irrigation area is located to the north of Manuka Creek, and no irrigation will pass over the creek. I have recommended that a fenced 5m riparian buffer be maintained between flowing sections of the creek and areas of irrigation and/or increased stock density. As Manuka Creek flows only intermittently in the section adjacent to the irrigation area, temporary fencing from stock during periods when the creek is flowing will be adequate here. The establishment of a 5m riparian buffer will be sufficient to protect and possibly improve existing aquatic ecosystem values.

4.23 As I have already discussed above for the Ahuriri River irrigation area any irrigation and subsequent pasture and crop production is likely to be beneficial to the main bird species that are currently found within the area.

5. FROSTY GULLY

5.1 Proposed irrigation

5.2 There is an existing dam (2.5m high) and water intake in Frosty Gully and it is intended that this will be used for the continuation of the existing irrigation scheme (28ha) (Figures 6 and 7). There is a 1mm mesh screen on the intake to the irrigation pipeline.

5.3 Existing aquatic and avifauna ecological values

5.4 Frosty Gully is a small stream sourced from springs and snowmelt (GHD 2009). The creek channel is largely unmodified upstream of the existing dam and it follows a relatively straight course down a small valley. Downstream of the dam

the stream flows a short distance (approximately 1km) through modified farmland to its confluence with Manuka Creek.

5.5 The upper reaches of Frosty Gully, above the existing dam, are generally flowing; however downstream of the dam the stream flows underground. At the time of my survey Frosty Gully was flowing downstream of the dam but did not have a surface flow connection to Manuka Creek (which was also not flowing at the confluence).

5.6 The creek channel is currently unfenced from stock and the riparian vegetation is modified, consisting mostly of pasture grasses, although there are remnant patches of native vegetation in the upper reaches.

5.7 Growths of long filamentous algae and diatom mats were observed in places upstream and downstream of the existing Frosty Gully take (Appendix One, Table 1). No Didymo growths were observed.

5.8 My one-off measurements of water quality found dissolved oxygen levels are high in the creek and conductivity and water temperatures are low, indicating good water quality. Macroinvertebrate communities in Frosty Gully immediately upstream and downstream of the existing take have high taxonomic diversity, are dominated by high quality *Deleatidium* species mayflies, and are indicative of 'excellent' biotic health (Appendix One, Table 2).

5.9 I found that small brown trout (length range 118-187mm) are present in Frosty Gully upstream of the dam. No fish were caught downstream of the dam.

5.10 Bird species identified in the vicinity of the proposed intake included bellbirds, grey warblers and silvereyes. These birds were located in a remnant area of mountain totara on the upper slopes of Frosty Gully upstream of the intake site. Within the vicinity of the proposed irrigation area the bird species observed included, blackbirds, introduced finches, black back gulls, magpies, hawks, silvereyes, skylarks, starlings and paradise ducks.

Figure 6 *Left: Frosty Gully upstream of existing dam and intake. Right: Existing intake and dam in Frosty Gully.*

Figure 7 *Left: Frosty Gully downstream of existing dam and intake. Right: Close-up of Frosty Gully dam outlet to lower stream.*

5.11 Potential effects on aquatic and avifauna ecological values and mitigation

5.12 Water take

5.13 The existing dam is 2.5m high and has a capacity of 500m^3. The proposed water take from the dam is a maximum rate of 20l/s, giving a maximum volume of 170,000m^3/year (over a six month irrigation season). No minimum flow is proposed below the dam. However, given that the dam has been present for approximately 28 years and the stream flows only intermittently downstream of

the dam, no further effects on the already modified aquatic ecological values of the creek downstream of the dam are anticipated as a result of continuing the existing irrigation.

5.14 The outlet of the dam does not appear to present a barrier to the movement of fish between the lower and upper reaches of Frosty Gully, and the presence of juvenile brown trout upstream of the dam suggests that when sufficient flows are present fish may move upstream from the Omarama Stream through Manuka Creek to Frosty Gully.

5.15 Construction

5.16 The Frosty Gully irrigation scheme will use an existing intake and pipeline and therefore there are no potential construction effects. The Manuka Creek pipeline will cross under the bed of Frosty Gully near its confluence with Manuka Creek. However, as Frosty Gully flows underground at this point, and the pipeline will be buried to a depth of 40cm, no effects on aquatic communities are anticipated.

5.17 Irrigation

5.18 The Frosty Gully irrigation scheme will be used to irrigate an area of 28ha to grow pasture for sheep and beef grazing (not dairy). This is an area of existing irrigation. The irrigation area is located to the north of Frosty Gully, and no irrigation will pass over the creek. A fenced 5m riparian buffer be maintained between flowing sections of the creek and areas of irrigation and/or increased stock density. As Frosty Gully flows only intermittently in the section adjacent to the irrigation area, temporary fencing from stock during periods when the creek is flowing will be adequate here. The establishment of a 5m riparian buffer will be sufficient to protect and possibly improve existing aquatic ecosystem values.

5.19 As I have already discussed above, any irrigation and subsequent pasture and crop production is likely to be beneficial to the main bird species that are currently found within the area.

6. RESPONSE TO SECTION 42A REPORTS

6.1 Woolshed Scheme

6.2 Officer's Reports 23E and F (Yvette Rodrigo) relate to the construction of an intake and taking of water from the Ahuriri River for the Woolshed Scheme.

6.3 In report 23E the Officer states that she agrees with the proposed minimum flow in terms of the potential effects on aquatic ecology and suggests that further detail be provided on fish screening to confirm that it is consistent with the appropriate fish screening guidelines (Jamieson *et al.* 2007). I agree with the Officer's assessment of the minimum flow and confirm that the gallery intake will comply with fish screening guidelines.

6.4 In report 23F the Officer states that although short term disturbances to the river bed and riparian zone will occur during intake construction with appropriate conditions to minimize disturbance adverse effects, including not carrying out works during the main periods of fish spawning and bird breeding, effects would be minor. I agree with the Officer's assessment and recommendations.

6.5 Pebbly Block

6.6 Officer's Reports 23C and D (Yvette Rodrigo) relate to the construction of an intake and taking of water from the Ahuriri River for the Pebbly Block Scheme.

6.7 In report 23C the Officer states that she agrees with the proposed minimum flow and that potential effects on aquatic ecology will be acceptable, provided that appropriate fish screening is provided. I agree with the Officer's assessment of the minimum flow and confirm that the screened intake will comply with fish screening guidelines (Jamieson *et al.* 2007).

6.8 In report 23D the Officer concludes that any adverse effects of works associated with construction of the take and discharge of surplus irrigation water will be minor. The Officer recommends a condition requiring that the discharge meet the standards set out in the Ahuriri River WCO. I agree with this recommendation.

6.9 Manuka Creek

6.10 Officer's Report 23A (Yvette Rodrigo) relates to the construction of an intake and taking of water from Manuka Creek.

6.11 The Officer states that she agrees with the proposed minimum flow and the potential effects on aquatic ecology will be acceptable providing that the minimum flow and appropriate fish screening conditions are adhered too. I agree with the Officer's assessment of the minimum flow and confirm that the gallery intake will comply with fish screening guidelines.

6.12 Frosty Gully

6.13 Officer's Report 23B (Yvette Rodrigo) relates to the damming and taking of water from Frosty Gully, both of which have existing consents.

6.14 The Officer states that although a minimum flow is not proposed for Frosty Gully downstream of the dam, given that the ecosystem has already been modified by existing activities over a long period, the continuation of both the damming and abstraction of water from Frosty Gully are unlikely to result in further adverse effects on the environment. I agree with this conclusion. In relation to fish passage the Officer notes that although fish screening may be appropriate and consistent with fish screen guidelines the effects on fish passage between the upper and lower reaches of Frosty Gully from the presence of the dam are uncertain. I have assessed fish passage within Frosty Gully and conclude that the outlet of the dam does not appear to present a barrier to the movement of fish between the lower and upper reaches of Frosty Gully, and the presence of juvenile brown trout upstream of the dam suggests that when sufficient flows are present fish may move upstream from the Omarama Stream through Manuka Creek to Frosty Gully. This situation will not be altered, as the proposed scheme is a continuation of the existing consent.

7. SUBMISSIONS

7.1 I have read the submissions received in regard to Killermont Station Limited's consent application and consider that the concerns raised by submitters relating to aquatic and avifauna ecological values have been adequately addressed in my evidence and in the mitigation and monitoring conditions that are recommended.

8. CONCLUSIONS

8.1 In my evidence, I have identified four waterways that may potentially be affected by the proposed irrigation on Killermont Station; the Ahuriri River, Tara Hills water race, Manuka Creek and Frosty Gully. I note that the Frosty Gully intake is an existing consented take and that consent for the Manuka Creek take has recently been granted. In my assessment of these watercourses I have found no information to suggest that water takes, or construction and irrigation activities that comply with the appropriate minimum flows, construction guidelines and the recommended monitoring and mitigation will have a more than minor effect on aquatic or avifauna ecological values.

Dr Ruth Goldsmith.

Dated 7 October 2009.

9. REFERENCES

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APPENDIX ONE:

BENTHIC MACROINVERTEBRATE AND PERIPHYTON DATA

Table 1 *Algae community data for Killermont Station Limited watercourses.*

Watercourse	Sample location	Dominant algae species present
Frosty Gully	Upstream of dam	Ulothrix, Diatoma
Frosty Gully	Downstream of dam	Gomphoneis, Ulothrix, Diatoma
Manuka Creek	At intake	Ulothrix, Zygnema
Ahuriri River	At Woolshed intake	Didymo, Synedra, Ulothrix
Ahuriri River	Upstream Pebbly intake	Didymo, Ulothrix
Ahuriri River	Downstream Pebbly intake	Didymo, Synedra, Ulothrix

Table 2 *Benthic macroinvertebrate community data for Killermont Station Limited watercourses.*

Watercourse		Frosty Gully	Frosty Gully	Manuka Creek	Ahuriri River	Ahuriri River	Ahuriri River
Sample location		Upstream of dam	Downstream of dam	At intake	At Woolshed intake	Upstream Pebbly intake	Downstream Pebbly intake
TAXON	**MCI score**						
ACARI	5				3		
COLEOPTERA							
Berosus species	5					1	1
Elmidae	6	9	5	8	17	48	26
Scirtidae	8	5	4				
CRUSTACEA							
Ostracoda	3	1					
Paracalliope fluviatilis	5						
DIPTERA							
Aphrophila species	5	1					
Austrosimulium species	3	4	1	38	4		4
Ceratopogonidae	3						
Chironominae	2	3	5	5		3	9
Empididae	3			2			
Eriopterini	9			3	2	1	1
Maoridiamesa species	3		2	3			
Muscidae	3					3	3
Orthocladiinae	2	45	45	18	2	33	48
Paralimnophila skusei	6						
Tanypodinae	5					2	
Unidentified diptera					1		
EPHEMEROPTERA							
Austroclima species	9					3	8
Coloburiscus humeralis	9	16				2	
Deleatidium species	8	207	106	299	121	49	65
Nesameletus species	9	3				4	4
MEGALOPTERA							
Archichauliodes diversus	7	7	1				
MOLLUSCA							
Gyraulus species	3						
Physella species	3						
Potamopyrgus antipodarum	4	5			11	4	1
Sphaerium novaezelandiae	3				1		
OLIGOCHAETA	1	7	11	5	1	14	6
PLECOPTERA							
Austroperla species	9	1					
Stenoperla prasina	10	2		1			
Zelandobius species	5	3	5		22	42	70
Zelandoperla species	10		4	12			
TRICHOPTERA							
Aoteapsyche species	4	31	3	2	4		
Beraeoptera roria	8	38	14	28			1
Confluens species	5	16					
Costachorema callistum	7			3			
Costachorema early instar	7	1					
Costachorema psaropterum	7	1					
Costachorema xanthopterum	7	1		1			1
Hudsonema amabile	6					16	27
Hydrobiosella stenocerca	9	1					
Hydrobiosidae early instar	5	1	2	3		1	
Hydrobiosis umbripennis group	5		2	2	1	2	1
Olinga species	9	19	9	31		8	3
Polyplectropus species	8						
Psilochorema species	8	3	3		5	5	
Pycnocentria species	7	2	4			1	11
Pycnocentrodes species	5	12	4	20	1	6	4
Zelolessica species	10	3	2				
Number of taxa		29	20	19	15	21	20
Number of invertebrates		448	232	484	196	248	294
MCI score		126	116	113	91	116	113
SQMCI score		6.6	6.6	6.8	7.1	5.4	5.4
SQMCI interpretation		excellent	excellent	excellent	excellent	good	good