

WHL KMT					
	Current loss kg	Proposed increase in nutrient loss over current and excluding buffer (PNDA) kg	Buffer kg	Total Nutrient Discharge allowance (NDA) including current and buffer kg	Staged NDA kg
	Current losses as given by Water Quality Study. To be confirmed in baseline monitoring year	= NDA- (Buffer + Current)	Difference between Developed and Highly Developed, or assigned buffer	Total Nutrients Required	80% of PNDA plus Current
Nitrogen	2978	14134	4174	21286	14285
Phosphorus	8	447	4	459	366

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	Current loss kg	PNDA Proposed increase in nutrient loss over current and excluding buffer kg	Buffer kg	NDA Total Nutrient Discharge allowance including current and buffer kg	Staged NDA kg
	Current losses as given by Water Quality Study. To be confirmed in baseline monitoring year	= NDA- (Buffer + Current)	Difference between Developed and Highly Developed, or assigned buffer	Total Nutrients Required	80% of PNDA plus Current
Nitrogen	5930	26801	5344	38075	27371
Phosphorus	152	1452	6	1610	1314

Monitoring Type	Parameter to be measured	Sites to be monitored
Groundwater quality	Total nitrogen, nitrate, ammonia, total Kjeldahl nitrogen, total phosphorus, dissolved reactive phosphorus	All groundwater monitoring bores in Ahuriri Groundwater subcatchment at mid aquifer depth. Shown as approximate location in Appendix 1 Figure 1a
Groundwater quality	Total nitrogen, nitrate, ammonia, total Kjeldahl nitrogen, total phosphorus, dissolved reactive phosphorus	ON farm bores as per FEMP scenario monitoring plan
Surface water quality	Total nitrogen, nitrate, ammonia, total Kjeldahl nitrogen, total phosphorus, dissolved reactive phosphorus, suspended solids, pH, and temperature	Omarama and Ahuriri sub catchment nodes
Surface water quality	Total nitrogen, nitrate, ammonia, total Kjeldahl nitrogen, total phosphorus, dissolved reactive phosphorus, suspended solids	Entry and exit of Tara Hills irrigation race
Surface water flow	Flow assessed when water quality sampling occurs.	Omarama and Ahuriri sub catchment nodes and on farm sampling
Surface water flow - Establish that FRE3 is sufficient to remove nuisance algal growths	Periphyton biomass before and after a FRE3 flow event	Omarama and Ahuriri sub catchment nodes
Aquatic ecology	Benthic invertebrates, macrophytes, and fish.	Tara Hills Irrigation race if required
Aquatic ecology	Periphyton	Tara Hills Irrigation race if required
Terrestrial ecology	Canada geese (if deemed required in consultation with Fish and Game)	On Farm

Terrestrial ecology	Mammalian predators (if deemed required in consultation with Department of Conservation)	On Farm
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Monitoring Type	Parameter to be measured	Sites to be monitored
Groundwater quality	Total nitrogen, nitrate, ammonia, total Kjeldahl nitrogen, total phosphorus, dissolved reactive phosphorus	All groundwater monitoring bores in Qualiburn and Wairepo Creek Groundwater subcatchments at mid aquifer depth. Shown as approximate location in Appendix 1 Figure 1a and b
Groundwater quality	Total nitrogen, nitrate, ammonia, total Kjeldahl nitrogen, total phosphorus, dissolved reactive phosphorus	ON farm bores as per FEMP scenario monitoring plan
Surface water quality	Total nitrogen, nitrate, ammonia, total Kjeldahl nitrogen, total phosphorus, dissolved reactive phosphorus, suspended solids, pH, and temperature	Wairepo Creek and Quailburn subcatchment nodes
Surface water quality	Total nitrogen, nitrate, ammonia, total Kjeldahl nitrogen, total phosphorus, dissolved reactive phosphorus, suspended solids	Entry and exit of Wairepo Creek and Serpentine Creek on property
Surface water flow	Flow assessed when water quality sampling occurs.	Wairepo Creek and Quailburn subcatchment nodes and on farm sampling
Clarify FRE3	Flushing Flows	Wairepo Creek
Surface water flow - Establish that FRE3 is sufficient to remove nuisance algal growths	Periphyton biomass before and after a FRE3 flow event	Wairepo Creek and Quailburn subcatchment nodes
Aquatic ecology	Benthic invertebrates, macrophytes, and fish.	Wairepo Creek, Serpentine Creek,

Aquatic ecology	Periphyton	Wairepo Creek, Serpentine Creek,
Terrestrial ecology	Canada geese (if deemed required in consultation with Fish and Game)	On Farm
Terrestrial ecology	Mammalian predators (if deemed required in consultation with Department of Conservation)	On Farm

Frequency of monitoring	Trigger	Action if trigger is exceeded
Quarterly. If after 2 years there is consistency between the quarterly samples this can be reduced to twice a year.	1 mg/l nitrate N where applicable	See Conditions 35-50
2 times per year	As per FEMP scenario monitoring plan	As per FEMP scenario monitoring plan
Monthly	ANZECC (2000) 0.167 mg/l nitrate-N, 0.009 mg/l DRP	See Conditions 35-50
Monthly	As per FEMP scenario monitoring plan	As per FEMP scenario monitoring plan
Monthly with water quality sampling.	NA	NA
One off	NA	NA
Annually for macroinvertebrates, macrophytes and fish.	No trigger determined	NA
Monthly from November – April for periphyton.	increase of 25% over current baseline Periphyton	NA
Birds in consultation with Fish and Game.	No trigger determined	NA

Mammalian predators in consultation with Department of Conservation.	No trigger determined	NA
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Frequency of monitoring	Trigger	Action if trigger is exceeded
Quarterly. If after 2 years there is consistency between the quarterly samples this can be reduced to twice a year.	1 mg/l nitrate N where applicable	See Conditions 35-50
2 times per year	As per FEMP scenario monitoring plan	As per FEMP scenario monitoring plan
Monthly	ANZECC (2000) 0.167 mg/l nitrate-N, 0.009 mg/l DRP	See Conditions 35-50
Monthly	As per FEMP scenario monitoring plan	As per FEMP scenario monitoring plan
Monthly with water quality sampling.	NA	NA
Continuous until FRE3 has been clarified	NA	NA
One off	NA	NA
Annually for macroinvertebrates, macrophytes and fish.	No trigger determined	NA

Monthly from November – April for periphyton.	increase of 25% over current baseline Periphyton	NA
Birds in consultation with Fish and Game.	No trigger determined	NA
Mammalian predators in consultation with Department of Conservation.	No trigger determined	NA

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Node	Subcatchment thresholds for nitrate N
Omarama Stream	0.167 mg/l at subcatchment node (ANZECC 2000 guideline for nitrate-N). Shown as approximate locations in Appendix 1 Figure 2
Ahuriri River	0.167 mg/l at subcatchment node (ANZECC 2000 guideline for nitrate-N). Shown as approximate locations in Appendix 1 Figure 2
Ahuriri Groundwater subcatchment	1 mg/l nitrate nitrogen mid aquifer. Shown as approximate locations in Appendix 1 Figure 1 a

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Node	ANZECC guidelines for Nitrate Nitrogen
Wairepo Creek	0.167 mg/l at subcatchment node (ANZECC 2000 guideline for nitrate-N). Shown as approximate locations in Appendix 1 Figure 2
Quailburn	0.167 mg/l at subcatchment node (ANZECC 2000 guideline for nitrate-N). Shown as approximate locations in Appendix 1 Figure 2
Ahuriri River	0.167 mg/l at subcatchment node (ANZECC 2000 guideline for nitrate-N). Shown as approximate locations in Appendix 1 Figure 2
Quailburn Groundwater subcatchment	1 mg/l nitrate nitrogen mid aquifer. Shown as approximate locations in Appendix 1 Figure 1a and b

Subcatchment thresholds for dissolved reactive phosphorus
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0.009 mg/l at sub-catchment node (ANZECC (2000) guideline for dissolved reactive phosphorus). Shown as approximate locations in Appendix 1 Figure 2

0.009 mg/l at sub-catchment node (ANZECC (2000) guideline for dissolved reactive phosphorus). Shown as approximate locations in Appendix 1 Figure 2

NA

ANZECC guidelines for Dissolved Reactive Phosphorus
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0.009 mg/l at sub-catchment node (ANZECC (2000) guideline for dissolved reactive phosphorus). Shown as approximate locations in Appendix 1 Figure 2

0.009 mg/l at sub-catchment node (ANZECC (2000) guideline for dissolved reactive phosphorus). Shown as approximate locations in Appendix 1 Figure 2

0.009 mg/l at sub-catchment node (ANZECC (2000) guideline for dissolved reactive phosphorus). Shown as approximate locations in Appendix 1 Figure 2

NA

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Lake	Monitoring Type	Parameter to be measured
Lake Benmore,	Water Quality	Vertical profile of temperature, dissolved oxygen, pH, total nitrogen, total phosphorus, ammonia, nitrate, nitrite, total Kjeldahl nitrogen, dissolved reactive phosphorus, Secchi depth, Chlorophyll-a
Lake Benmore,	Lake sediment	Total nitrogen, total phosphorus
Lake Benmore	Headwater Delta Ecology	Benthic invertebrates, macrophytes, periphyton, phytoplankton and fish.

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Lake	Monitoring Type	Parameter to be measured
Lake Benmore, Lake Ruataniwha, and Wairepo Arm	Water Quality	Vertical profile of temperature, dissolved oxygen, pH, total nitrogen, total phosphorus, ammonia, nitrate, nitrite, total Kjeldahl nitrogen, dissolved reactive phosphorus, Secchi depth, Chlorophyll-a
Lake Benmore, Lake Ruataniwha, and Wairepo Arm	Lake sediment	Total nitrogen, total phosphorus
Lake Benmore	Headwater Delta Ecology	Benthic invertebrates, macrophytes, periphyton, phytoplankton and fish.

Sites to be monitored	Frequency of monitoring	Trigger	Action if trigger is exceeded
Lake Benmore, Ahuriri Arm, Shown as approximate locations in Appendix 1 Figure 3	Monthly	TLI 2.75 for Lake Benmore, Ahuriri Arm (Oligotrophic).	See conditions 35-50
Lake Benmore, Ahuriri Arm, Shown as approximate locations in Appendix 1 Figure 3	Every 3 years	No trigger set	No trigger set
Lacustrine delta of Lake Benmore, Ahuriri Arm. Shown as approximate locations in Appendix 1 Figure 3	Late summer and late winter	No trigger set	No trigger set

Sites to be monitored	Frequency of monitoring	Trigger	Action if trigger is exceeded
Lake Benmore, Ahuriri Arm, Northern Arm, and near Benmore Dam, Lake Ruataniwha and Wairepo Arm. Shown as approximate locations in Appendix 1 Figure 3	Monthly	TLI 2.75 for Lake Benmore (Oligotrophic). TLI for Wairepo Arm maintained in Mesotrophic	See conditions 35-50
Lake Benmore, Ahuriri Arm, Northern Arm, and near Benmore Dam, Lake Ruataniwha and Wairepo Arm. Shown as approximate locations in Appendix 1 Figure 3	Every 3 years	No trigger set	No trigger set
Lacustrine delta of Northern Arm and Ahuriri Arm. Shown as approximate locations in Appendix 1 Figure 3	Late summer and late winter	No trigger set	No trigger set

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Lake	Trophic Level Index TLI
Lake Benmore Ahuriri Arm	Maintenance in Oligotrophic state 2.75

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Lake	Trophic Level Index TLI
Wairepo Arm Lake TLI	Maintenance of current mesotrophic state
Lake Benmore Northern Arm	Maintenance in Oligotrophic state 2.75
Lake Benmore Ahuriri Arm	Maintenance in Oligotrophic state 2.75