

10 August 2026



Ashburton Lyndhurst Irrigation Limited
Attn To: Rebecca Whillans
326 Burnett Street
Ashburton 7700

Advisory Team
0800 324 636
200 Tuam Street
PO Box 345, Christchurch 8140
ecan.govt.nz/contact

Dear Rebecca,

Correction to Resource Consent Decision

Record Number: CRC185469
Applicant Name: Ashburton Lyndhurst Irrigation Limited
Activity Description: To discharge nutrients onto and into land

It has come to our attention that there was an error in the above consent. As such, please destroy the document currently in your possession and replace it with the enclosed corrected decision document.

Error identified

Condition 29(g) states “a summary of any significant change applications considered in accordance with Condition 11.” The word ‘significant’ should read as “Material’ as written in the Environment Court Consent Order dated 14 April 2026.

Condition (29)(g) currently reads:

“a summary of any **significant change** applications considered in accordance with Condition 11.”

Condition (29)(g) has been amended to read:

“a summary of any **Material Change** applications considered in accordance with Condition 11.”

Queries

For all queries, please contact our Advisory Team quoting your CRC number above.

Yours sincerely,

Debbie Curle
Regulatory Support Officer

cc:
Pattle Delamore Partners Limited
Attn To: Alida Van Vugt
PO Box 389
Christchurch 8140

RESOURCE CONSENT CRC185469

Under Section 104 of the Resource Management Act 1991

The Canterbury Regional Council (known as Environment Canterbury)

GRANTS TO: Ashburton Lyndhurst Irrigation Limited

A DISCHARGE PERMIT (S15): To discharge nutrients onto and into land

COMMENCEMENT DATE: 14 April 2026

DATE CONSENT NUMBER
ISSUED: 14 April 2026

EXPIRY DATE: 31 December 2030

LOCATION: Between the Rakaia and Ashburton Rivers, Ashburton

SUBJECT TO THE FOLLOWING CONDITIONS:

Scope

- 1 This consent authorises the discharge onto or into land where contaminants may enter water arising from farming land use activities on Properties:
 - a. listed in Schedule CRC185469A, or any subsequent revisions thereof as provided for under Condition 7; and
 - b. located within the area shown on Plan CRC185469A (the Command Area).

Definitions

2	Land Types										
	<table><tr><th>Term</th><th>Definition</th></tr><tr><td>Dry Land</td><td>Land that is not irrigated but where nitrogen losses are managed under this consent and which is not Lawfully Intensified PC5 Land.</td></tr><tr><td>Existing Scheme Irrigated Land</td><td>Land lawfully supplied with irrigation water supplied by an irrigation scheme or principal water supplier prior to 26 May 2014.</td></tr><tr><td>Lawfully Intensified PC5 Land</td><td>Land which lawfully increased its nutrient losses above its baseline nitrogen loss rate between 31 December 2013 and 13 February 2016.</td></tr><tr><td>Other Irrigated Land</td><td>Land that is irrigated from any source and which is not Existing Scheme Irrigated Land or Lawfully Intensified PC5 Land.</td></tr></table>	Term	Definition	Dry Land	Land that is not irrigated but where nitrogen losses are managed under this consent and which is not Lawfully Intensified PC5 Land.	Existing Scheme Irrigated Land	Land lawfully supplied with irrigation water supplied by an irrigation scheme or principal water supplier prior to 26 May 2014.	Lawfully Intensified PC5 Land	Land which lawfully increased its nutrient losses above its baseline nitrogen loss rate between 31 December 2013 and 13 February 2016.	Other Irrigated Land	Land that is irrigated from any source and which is not Existing Scheme Irrigated Land or Lawfully Intensified PC5 Land.
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Other Irrigated Land	Land that is irrigated from any source and which is not Existing Scheme Irrigated Land or Lawfully Intensified PC5 Land.										

Advisory note: All land on a Property managed by the Consent Holder under this resource consent shall fall in one or more of the land types listed. Dry Land, Lawfully Intensified PC5 Land and Other Irrigated Land may be located on Properties that are not subject to a water supply agreement with the Consent Holder

Other Definitions

Term	Definition
Associated Properties	Properties which are not Authorised Properties and which do not receive irrigation water from the Ashburton Lyndhurst Irrigation Scheme, but which are Properties where the nutrient losses are managed by the Consent Holder.
Authorised Properties	Properties that the Consent Holder has elected to treat as Authorised Properties for the purposes of Conditions 8 and 9.
Certified Freshwater Farm Plan	A freshwater farm plan certified under section 217G of the Resource Management Act 1991 (as amended from time to time in accordance with section 217E(2) or (3)), or as provided for by the Resource Management (National Environmental Standards for Freshwater) Regulations 2020
CDWPZ Impacted Land	Land that is included in a Community Drinking Water Protection Zone, plus any other land within the same paddock where it not possible to treat such further land on a different management basis for the purposes of Condition 20. <i>Advisory note: For example:</i> • <i>it will typically not be possible to provide differential stock grazing within the same paddock; and</i> • <i>it may be possible to provide differential management for a cropping or horticultural operation in the same paddock.</i>
Commencement Date	The date that this resource consent (CRC185469) is given effect to, without limiting any amendment to the reporting requirements as may be agreed in accordance with Condition 31.
Community Drinking Water Protection Zone	A Community Drinking Water Protection Zone as identified in Schedule 1 of the Canterbury Land and Water Regional Plan.
2020 Load	The nitrogen leaching load for the period 1 January 2020 to 31 December 2020, calculated using the Nutrient Calculation.
Deterioration	Means a deterioration in the water quality attribute state(s) or band(s) (as might apply) for the contaminants described in Table CRC185469-2, as:

	• based on the based attribute state(s) to be determined in accordance with condition 23(b); and • the further monitoring and analyses contemplated by conditions 22 to 24 (including any other method certified as appropriate through any review of the Environmental Monitoring Programme in accordance with conditions 26-28).
Farm Environment Plan	A Farm Environment Plan in the form set out in Schedule CRC185469C: • as may be amended following mutual agreement with the Regional Leader - Monitoring and Compliance, Canterbury Regional Council; or • should the use of a <i>Certified Freshwater Farm Plan</i> be required or available on the basis it is certified and available for use then the Consent Holder may, as may be mutually agreed with the Regional Leader - Monitoring and Compliance, Canterbury Regional Council elect to use such a plan (and which will then take the place of Schedule CRC185469C).
Farming Land Use Activity	All Agricultural and Horticultural land uses (whether irrigated or not) and including but not limited to: • dairy farming, dairy support, winter grazing, sheep and beef farming, deer, pig and goat farming, arable/cropping, fruit & vegetable productive land uses and other agricultural and horticultural land use and forestry/ineffective areas. • the expansion of dairy support land and irrigated dairy farm land, the conversion of land to dairy farm land and the undertaking intensive winter grazing.
Good Management Practice (GMP)	The farming practices which are described in the document titled <i>Industry Agreed Good Management Practices relating to water quality (2015)</i>
Management Plan for Farming Activities	A <i>Management Plan for Farming Activities</i> in the form set out in Schedule CRC185469D: • as may be amended following mutual agreement with the Regional Leader - Monitoring and Compliance, Canterbury Regional Council; or • should the use of a <i>Certified Freshwater Farm Plan</i> be required or available on the basis it is certified and available for use then the Consent Holder may, as

	may be mutually agreed with the Regional Leader - Monitoring and Compliance, Canterbury Regional Council elect to use such a plan (and which will then take the place of Schedule CRC185469D).
Material Change	Means any change in the farming activity parameters (being the description of the farm system(s)) used for the Nutrient Calculation) for a Property, as to be further defined by the Environmental Management Strategy (EMS).
Nutrient Allocation Zone	A nutrient allocation zone within the area shown on Plan CRC185469A.
Nutrient Calculation	means the methodology to calculate nutrient loss for all properties that are not Authorised Properties, being one of: 1. the Matrix Method (as approved by the Chief Executive of the Canterbury Regional Council on 29 April 2020) and as included in Schedule CRC185469B; or 2. the current version of OVERSEER® provided that: 1. losses are based on the farming activity occurring within the period 1 January 2020 to 31 December 2020 (except to the extent that condition 2(c) of this definition applies); 2. all inputs shall be updated to reflect the current OVERSEER® Best Practice Data Input Standards, as based on the same baseline scenario); and 3. if the nitrogen loss calculation for any dairy farming operation where a building consent and effluent discharge consent was granted for a new or upgraded dairy milking shed in the period 1 January 2009 to 31 December 2013, shall be on the basis that the dairy Farming Land Use Activity is operational; 3. any other equivalent method approved by the Chief Executive of Environment Canterbury. Advice note: <i>It is intended that only one Nutrient Calculation method will be used for all scheme properties that are not Authorised Properties at any one time. Condition 29(e)(ii) addresses how previously reported loads are to</i>

	<i>be considered under any new Nutrient Calculation.</i>
Nutrient Discharge Allowance (NDA)	The Nutrient Discharge Allowance as determined by Conditions 3 to 6.
Property	Any contiguous area of land, including land separated by a road or river, held in one or more than one ownership, that is utilised as a single operating unit, and may include one or more certificates of title.
Sensitive receptor	Areas of wetland, surface water bodies and riparian areas, sites of cultural significance (as may be further defined in consultation with Te Rūnanga o Arowhenua) and, in the case of any land located within a Community Drinking Water Protection Zone, the Community Drinking Water Supply.

Schedules of Properties covered by this consent

- 3 Schedule CRC185469A attached to and forming part of this consent, shall specify:
- The Nutrient Allocation Zone(s) within which each Property is located; and
 - the load that has been calculated or deemed for each Property in accordance with Conditions 4 to 6; and
 - a total aggregated NDA for each Nutrient Allocation Zone, being the sum of the assessed nitrogen losses from all Properties provided for in Conditions 4(a) and (b) and identified in the relevant part of Schedule CRC185469A.

Advisory note 1: Where a Property is located within more than one Nutrient Allocation Zone, the load shall be allocated on a pro rata basis against the relevant land area(s).

Advisory note 2: Where a Property is supplied water by more than one scheme which also holds a discharge consent the load shall be allocated on a pro-rated basis proportionally on a contracted flow basis or on such other basis as may be determined in consultation with the Canterbury Regional Council while ensuring all losses are accounted for (and not double counted) as between the schemes.

Requirement to meet GMP and to make further reductions

- 4 The nitrogen losses for each Property listed in ScheduleCRC185469A shall:
- For Existing Scheme Irrigated Land, Other Irrigated Land and Dry Land, be calculated on the basis of:
 - the 2020 Load; and
 - with nitrogen losses from such land being further limited to GMP; and
 - further reduced:
 - from 1 January 2025, by 10% from the 2020 Load; and

- b. from 1 January 2030, by 20% from the 2020 Load,
- b. For Lawfully Intensified PC5 Land, be a deemed loss rate of 27 kg N/ha/year, when modelled with OVERSEER® version 6.0.3,
- c. For Authorised Properties, be listed in a separate part of Schedule CRC185469A with a nominal value of 'zero', as deemed in accordance with Conditions 8 and 9.

Advisory note 1: Where a Property meets more than one of the above criteria, the nitrogen losses for the Property are calculated on a weighted average of the parcels which form the Property.

Advisory note 2: Authorised Properties are not subject to any individual nutrient loss limit (and nor do they contribute to or be deducted from the Scheme NDA's for the purposes of Conditions 3 to 6). Their inclusion in Schedule CRC185469A is to ensure their inclusion and wider management by the Scheme is clear.

Advisory note 3: The effect of Condition 4(c) is to ensure the load from Authorised Properties cannot be aggregated with Properties managed under Conditions 4(a) and (b).

- 5 The maximum annual amount of nitrogen that is lost to water from the Properties described in Condition 4(a) and (b) and listed in Schedule CRC185469A shall not exceed the combined and aggregated NDA of those Properties.

Advisory note: Authorised Properties do not contribute to the load limits described in this Condition 5.

- 6 The NDA to be determined in accordance with Conditions 4 and 5:
 - a. shall be calculated using the Nutrient Calculation,
 - b. for land listed within Schedule CRC185469A at the Commencement Date, may be updated at any time further information becomes available, provided that:
 - i. the update is consistent with the assessment methodology described for the Nutrient Calculation;
 - ii. information on the changes (including information on the actual land use and irrigation system) is recorded to support each change, including confirmation that the change remains consistent with Condition 4;
 - iii. a revised Schedule CRC185469A including any updates is to be provided Attention: Compliance Manager, Canterbury Regional Council and any assessments undertaken are provided to the Canterbury Regional Council on request.

Addition and removal of Properties from Schedule CRC185469A

- 7 Properties (or land) may be added or removed from Schedule CRC185469A, provided:
 - a. the Consent Holder provides the updated schedule by 1 December in any year that a change occurs to Schedule CRC185469A, Attention: Compliance Manager, Canterbury Regional Council and Te Rūnanga o Arowhenua, including:
 - i. the revision number of the schedule; and

- ii. an updated consent wide map showing all Properties managed under this consent and the relevant Nutrient Allocation Zone boundary; and
 - iii. an electronic copy of the plan in Condition 7(a)(ii) above, in a commonly used Geographic Information System (GIS) format; and
- b. in the case of any Property (or land) joining the Scheme and described in Condition 4(a) and (b) and listed in Schedule CRC185469A, the Consent Holder shall, unless the Property is being treated as an Authorised Property, apply the Nutrient Calculation to the Property's (or land's) nitrogen baseline and make the assessment available to the Canterbury Regional Council on request.

Obligations in relation to Authorised Properties

8 Any Property that is:

- a. less than 10 hectares in area; or
- b. greater than 10 hectares, and where
 - i. the area of the property authorised to be irrigated with irrigation water from any source is:
 - A. less than 50 hectares; and
 - B. for any property where irrigation was occurring as at 13 February 2016, the area of the property authorised to be irrigated has not increased by more than 10 hectares above that which was irrigated as at 13 February 2016, and
 - ii. the area used for winter grazing (as defined in the Canterbury Land & Water Regional Plan at the Commencement Date) is less than:
 - A. 10 hectares, for any property that is less than 100 hectares in area; or
 - B. 10% of the area of the property for any property between 100 hectares and 1000 hectares in area; or
 - C. 100 hectares, for any property that is greater than 1000 hectares in area,

may be treated by the Consent Holder as an Authorised Property for the purposes of this consent.

9 In relation to any Property that the Consent Holder has elected to treat as an Authorised Property in accordance with:

- a. Condition 8(a):
 - i. any nitrogen losses shall not contribute to or be deducted from the Scheme NDA for the purposes of Conditions 3 to 6; and
 - ii. losses from that Property will be listed on Schedule CRC185469A with a nominal nutrient discharge allowance of '0'.
- b. Condition 8(b):

- i. the Consent Holder shall require that each such Authorised Property maintain a Management Plan for Farming Activities or Certified Freshwater Farm Plan as required by Condition 17(b);
- ii. any nitrogen losses shall not contribute to or be deducted from the Scheme NDA for the purposes of Conditions 3 to 6; and
- iii. losses from that Property will be listed on Schedule CRC185469A with a nominal nutrient discharge allowance of '0'.

Advisory note 1: This resource consent enables the Consent Holder to supply water to Properties that would otherwise be able to be farmed as or in similar circumstances as permitted farming land use activities outside of the scheme ASM programme. The nutrient losses from such Properties are authorised by this consent but the Consent Holder may choose to either manage the losses on the basis of being an Authorised Property or in accordance with Conditions 3 to 6.

Audited Self-Management Programme

10 From:

- a. the Commencement Date, the consent shall comply with the Audited Self-Management Programme (ASM), including Environmental Management Strategy (EMS) that was developed by the consent holder and operative immediately prior to that date. In complying with this Condition 10(a), the Consent Holder shall consult with the Compliance Manager, Canterbury Regional Council to determine how compliance and the transitional regime for any replacement EMS as required by Condition 10(b) are to be implemented. Should a transitional regime be agreed then the Consent Holder shall comply with it on the basis that it forms part of the conditions of this consent; and
- b. within 12 months of the Commencement Date, the Consent Holder shall update and comply thereafter with the revised EMS that is to be prepared in accordance with Conditions 11 to 13.

11 The EMS required by Condition 10(b) shall:

- a. identify the roles and responsibilities of the persons and entities involved in the management of the Consent Holder's environmental programme and the implementation of this resource consent;
- b. implement environmental objectives and targets for all Properties described in Condition 4(a) and (b) to ensure:
 - i. this resource consent CRC185469 is complied with;
 - ii. Properties provided for in Conditions 4(a) and (b) implement GMP and the reductions required by Condition 4(a)(iii) to ensure nutrient loss reduces over time and there is a reduction in any adverse effects on receiving waterbodies; and
 - iii. Properties required to hold a Farm Environment Plan are achieving or working towards the achievement of an A Audit.

- c. ensure the Consent Holder has robust audit and reporting procedures in place to ensure a high level of compliance with *Farm Environment Plans, Management Plans for Farming Activities or Certified Freshwater Farm Plans* (as might apply);
- d. specify the steps that will be undertaken (including consequences to ensure future compliance) for Properties where Condition 11(b)(ii) and (iii) applies and is not being met;
- e. have appropriate procedures in place (through the EMS and each *Farm Environment Plan, Management Plan for Farming Activities or Certified Freshwater Farm Plans*) to ensure the identification of effects on neighbouring sensitive receptors are appropriately avoided, remedied or mitigated;
- f. be consistent with the Environmental Monitoring Plan and associated requirements provided for in Conditions 21 to 26;
- g. require that any Properties wanting to undertake a Material Change will first need to obtain the approval of the Consent Holder, with the EMS providing details on how applications for Material Change are to be assessed, including procedures to ensure applications for such change are only approved in a manner that:
 - i. ensures the consent holder continues to comply with its aggregated NDA; and
 - ii. avoids, remedies or mitigates effects on local sensitive receptors.
- h. provide reproducible methodology on:
 - i. how the nutrient load limits are calculated, and the rationale for that nutrient load applied; and
 - ii. how nutrients from all land subject to this resource consent will be accounted for, and

provides detail on how the management of Properties joining or leaving the scheme is to occur (including the methodology for allocating nutrients).

12 The EMS shall provide for or require:

- a. effects on neighbouring sensitive receptors to be managed through further measures (in addition to Condition 11(e)), including:
 - i. requiring that stock are excluded from waterbodies in accordance with Regional Council rules, any granted resource consent(s) and the Resource Management (Stock Exclusion) Regulations 2020; and
 - ii. encouraging the establishment of vegetated riparian strips to minimise nutrient, sediment and microbial pathogen loss to waterbodies.
- b. the management of nutrient losses on Properties (which are not Authorised Properties) through a *Farm Environment Plan or Certified Freshwater Farm Plan* (as might apply) and audit process in accordance with the conditions of this resource consent.
- c. Properties provided for in Conditions 4(a) and (b) shall:
 - i. have their annual nutrient losses assessed in accordance with the Nutrient Calculation identified in Schedule CRC185469B; and

- ii. be subject to an audit procedure in accordance with Condition 18 and 19, with the Farm Environment Plan audit records for each Property undertaken being kept and made available for the Canterbury Regional Council to inspect, upon request; procedures to enable each *Farm Environment Plan, Management Plan for Farming Activities or Certified Freshwater Farm Plan* to be amended to address any changes that might be recommended following the preparation of a Remediation and Response Plan that is prepared in accordance with Condition 25.
 - d. within 20 working days of the exit of any Property from Schedule CRC185469A (and the management of nutrient losses by the Consent Holder), the Consent Holder is to advise the Canterbury Regional Council of the authorised land use that is to apply to the departing Property.
- 13 When preparing the EMS or seeking amendments to any of the matters listed in Conditions 11 and 12, the Consent Holder shall:
- a. engage with the Chair of Te Rūnanga o Arowhenua or their representative to discuss the finalisation of the EMS content listed in Condition 12 within reasonable timeframes. The purpose of the engagement is to consult with Te Rūnanga o Arowhenua and to enable Te Rūnanga o Arowhenua to participate in and have input into the preparation of the EMS or any amendment to the EMS. The Consent Holder shall, subject to any alternative procedure that might be agreed with Te Rūnanga o Arowhenua and advised by the Compliance Manager, Canterbury Regional Council:
 - i. provide drafts of the EMS or amendments to the EMS along with any relevant supporting materials to Te Rūnanga o Arowhenua at least six weeks prior to the documents being submitted to the Canterbury Regional Council for certification;
 - ii. offer to meet with Te Rūnanga o Arowhenua representatives within the six week period referred to in Condition 13(a)(i), for the purposes of discussing the EMS or amendments to the EMS;
 - iii. incorporate the comments or changes received from Te Rūnanga o Arowhenua into the EMS or the amended EMS, except that if the Consent Holder determines the comments or changes are not appropriate, it shall undertake further consultation with Te Rūnanga o Arowhenua to see if alternative further changes can be made. If the Consent Holder determines that further changes cannot be made then it shall prepare a document that records the comments or changes that have not been included and the reasons for not including them.
 - b. The updated EMS along with any document to be prepared in accordance with Condition 13(a) are to be provided to Te Rūnanga o Arowhenua at the time of seeking certification from the Canterbury Regional Council in accordance with Condition 14.
- 14 Any amendment to the EMS that has been prepared in accordance with Conditions 11 to 13 shall be submitted to the Attention: Compliance Manager, Canterbury Regional Council for certification. Any changes shall only be implemented following certification by the Compliance Manager, Canterbury Regional Council that the EMS meets the requirements of Conditions 11 and 12.

- 15 a. In the six month period prior to:
- i. 1 December 2027; and
 - ii. 1 December in each year after the Commencement Date but not provided for by Conditions 15(a)(i), (and any additional times as may be agreed to by the Compliance Manager, Canterbury Regional Council), the Consent Holder shall engage a suitably qualified and independent expert to undertake a review of the EMS that shall include:
 - iii. for the reviews to be undertaken in accordance with:
 - a. Condition 15(a)(i), a full review of the EMS;
 - b. Condition 15(a)(ii), a review of at least one third of the EMS (to be rotated annually at each EMS review to ensure the full EMS is, including previous reviews prior to the Commencement Date, reviewed at least once every three years),

for the purpose of identifying and discussing the implementation of the EMS and any improvements that may be able to be made to better achieve the objectives developed in line with Condition 11(b); and

- iv. for all reviews:
 - A. a review of any changes made to the use of the property irrigation, land use and management standards as applied through the Nutrient Calculation when calculating the scheme nitrogen losses; and
 - B. a review of the process undertaken to update any changes made to the nutrient budget reference files used to calculate scheme nitrogen load limits and losses into the most recent version of OVERSEER®
- b. Following the review, the Consent Holder shall provide a copy of the review report to Te Rūnanga o Arowhenua and offer to meet with it for the purposes of discussing the findings of the review, and any amendments that might be made to the EMS.
- c. A copy of the review shall be provided Attention: Compliance Manager, Canterbury Regional Council as a part of the annual report to be provided under Condition 29.

- 16 In the event that a Property is excluded from the ASM programme then the Consent Holder shall notify Te Rūnanga o Arowhenua and the Compliance Manager, Canterbury Regional Council within 20 working days of the exclusion.

Farm Environmental Plans, Management Plans for Farming Activities or Certified Freshwater Farm Plans

- 17 For all Properties where farming activities are undertaken, and unless Condition 9(a) applies, the Consent Holder shall ensure that:
- a. Properties provided for in Condition 4(a) and (b) maintain a *Farm Environment Plan*;
 - b. Properties provided for in Conditions 4(c) and 8(b) maintain a *Management Plan for Farming Activities*.

Farm Environmental Plan Audits

- 18 No later than 12 months after the Commencement Date, all Farm Environment Plans as required by Condition 17(a) shall be audited within the frequency determined by the audit grade received in the previous audit, as provided for in Table CRC185469-1 below:

Table CRC185469-1

	Audit Grade	Audit Frequency
	No change in management or Material Change	Change in management or Material Change
A		1 year
B	2 years	1 year
C	1 year	In the following year
D	6 months	Within 6 months
A "year" is the period from 1 July to the following 30 June.		

or

- a. in the case of Properties added to Schedule CRC185469A, within one year of the Property being added to that Schedule; or
 - b. in the case of a Property located within a Community Drinking Water Protection Zone where the risk level increased, within one year of the completion of the updated risk assessment; or
 - c. where there are exceptional circumstances, and the Consent Holder is able to obtain an approved exemption (in writing) from the Compliance Manager, Canterbury Regional Council from the frequencies of audits identified in Conditions 18(a) and (b). For the purposes of this condition 'exceptional circumstances' may include any event or action that reasonably prevents an audit being undertaken - including but not limited to any event of force majeure, the death or serious illness of a shareholder or shareholder's representative(s) or their dependents, biosecurity or natural hazards, or recent Property sales or lease changes; or
 - d. should a Certified Freshwater Farm Plan be certified and available for use in accordance with Condition 17 and is adopted by the Consent Holder shall comply with the required timings for audits provided for in that plan (and if no audit process is provided for then the Consent Holder shall comply with timeframes for audit set out in the Conditions 18(a) to (d)).
- 19
- a. *Farm Environment Plans* audits shall be conducted in accordance with the 'Certified Farm Environment Plan Auditor Manual', May 2020, or such other methodology (including any subsequent version of the 'Certified Farm Environment Plan Auditor Manual', May 2020) as may be mutually agreed with the Compliance Manager, Canterbury Regional Council, including the timing and implementation of such other methodology.
 - b. The audit of *Certified Freshwater Farm Plan* shall be undertaken in accordance with any associated guidance manual, or if no audit process is provided for, or no such guidance material available, the audits shall be undertaken on the basis of applying the 'Certified Farm Environment Plan Auditor Manual' with any necessary modifications as may be mutually agreed with the Compliance Manager, Canterbury Regional Council.

- c. If requested by the Compliance Manager, Canterbury Regional Council, the Consent Holder shall facilitate the Canterbury Regional Council undertaking spot checks of any Farm Environment Plan Auditors previously approved by Canterbury Regional Council. This shall include providing copies any audits and the relevant supporting information that are available to the Consent Holder.

Community Drinking Water Supplies

- 20 For any Property falling partly or wholly within a Community Drinking Water Protection Zone, the Consent holder shall ensure:
- a. Discharges from the Property are assessed and managed in discussion with the impacted shareholder(s) and the Community Drinking Water Supplier in accordance with Schedule CRC185469E, and in a manner that is consistent with the Resource Management (National Environmental Standard for Sources of Human Drinking Water) 2007, and with any assessment completed by the Consent Holder prior to the Commencement Date. The Consent Holder shall further ensure that further assessments are completed:
 - i. at least once every three years for Properties with existing Community Drinking Water Protection Zone risk assessments;
 - ii. within three months of a Property within a Community Drinking Water Protection Zone being added to Schedule CRC185469A (including a new Community Drinking Water Protection Zone being added to Schedule 1 of the Canterbury Land & Water Regional Plan that includes Property(ies) that have not been previously assessed in accordance with Schedule CRC185469E);
 - iii. within three months of the Consent Holder becoming aware of information that may materially impact on any assessment previously undertaken; and
 - iv. within three months of any change to the area of an existing Community Drinking Water Supply Protection Zone taking formal effect for the purposes of Schedule 1 of the Canterbury Land & Water Regional Plan.
 - b. Where a Community Drinking Water Protection Zone Risk Assessment identifies the Property as:
 - i. *Low Risk*; there shall be no further management actions required in relation to the farming activities able to occur on the CDWPZ Impacted Land (subject to compliance with this resource consent and permitted activity rules related to Community Drinking Water Protection Zones);
 - ii. *Medium Risk*; the farming activities able to occur on the CDWPZ Impacted Land shall be managed to (in addition to compliance with this resource consent and permitted activity rules related to Community Drinking Water Protection Zones):
 - A. avoid the discharge of solid or liquid effluent (including animal based manures) within 20 metres of the Community Drinking Water Protection Zone;
 - B. ensure all irrigation on the CDWPZ Impacted Land in the Community Drinking Water Protection Zone is undertaken using good management practice to minimise drainage to groundwater; and

- C. implement any other site-specific recommendations that are consistent with managing Medium Risk activities and that are identified in the Community Drinking Water Protection Zone Risk Assessment.
- iii. *High Risk*; the farming activities able to occur on the CDWPZ Impacted Land shall be managed to (in addition to compliance with this resource consent and permitted activity rules):
 - A. avoid the discharge of solid or liquid effluent (including animal based manures) within 20 metres of the Community Drinking Water Protection Zone;
 - B. avoid any winter grazing (as defined in the Canterbury Land & Water Regional Plan at the Commencement Date) within the CDWPZ Impacted Land;
 - C. ensure all irrigation on the CDWPZ Impacted Land in the Community Drinking Water Protection Zone is undertaken using good management practice to minimise drainage to groundwater;
 - D. ensure there is no increase in stocking rate or fertiliser application on the CDWPZ Impacted Land in the Community Drinking Water Protection Zone; and
 - E. implement any other specific recommendations that are consistent with managing Medium and/or High Risk activities and that are identified in the Community Drinking Water Protection Zone Risk Assessment.
- c. All new Community Drinking Water Protection Zone Risk Assessments prepared after the commencement date are to be reviewed by a suitably qualified and experienced individual prior to implementation of the required actions set out in the risk assessment for the Property.
- d. Where a Community Drinking Water Protection Zone Risk Assessment review increases the risk status of a Property compared to previous assessments, the assessments are to be provided to the Compliance Manager, Canterbury Regional Council prior to the implementation of the required actions set out in the risk assessment for the Property.
- e. as a part of the *Farm Environment Plan, Management Plan for Farming Activities or Certified Freshwater Farm Plan* (as might apply) for any Property located within the Community Drinking Water Protection Zone, there shall be additional requirements:
 - i. to include an objective that seeks to ensure land located within the Community Drinking Water Protection Zone is managed to prevent deterioration of drinking water from activities occurring on that land; and
 - ii. for the Property Owner to maintain records to demonstrate all agreed minimum actions are being implemented,
- f. without limiting Condition 20(b), the Consent Holder shall, as soon as practicable, and in all cases within two working days, notify relevant Community Drinking Water Supplier, and the Compliance Manager, Canterbury Regional Council, if it becomes aware of an “*Event*” that may have an adverse effect on the quality of the water in the community supply bore, with an “*Event*” for the purposes of this consent meaning, but not limited to, an incident within the well protection zones of the relevant community supply bore that may contaminate the water supply from the community supply bore - such as accidental

release of pollutants or excessive stock access, combined with the saturation of soil beyond the water retaining capacity(e.g. over-irrigation).

Advisory note: the level of mitigation required should apply based on whichever contaminant has the highest risk rating.

Environmental Monitoring

- 21 The Consent Holder shall comply with the Environmental Monitoring Plan previously approved by the Compliance Manager, Canterbury Regional Council, that satisfies Conditions 22 and 23 and is in place at the Commencement Date.
- 22 The objectives of the Environmental Monitoring Plan are to:
- a. obtain further water quality information that may assist in better understanding the effects of nutrient discharges from properties within Schedule CRC185469A:
 - i. on groundwater nitrate-nitrogen concentrations over-time; and
 - ii. surface water quality over time; and
 - b. require the reporting of any water quality information gathered to the Canterbury Regional Council for the purpose of better informing future water resource management in the Command Area;
 - c. require the Consent Holder to investigate and respond to changes in water quality attribute state(s) or band(s) (as might apply) for certain contaminants as to be identified based on five years of data collected for the five year period commencing 1 June 2022 in accordance with Condition 23 as specified in Table CRC185469-2; and
 - d. require, once the 5-year period provided for in Condition 22(c) is complete that the Consent Holder undertake additional monitoring and analyses as described in Table CRC185469-2. The purposes of the analyses shall be to further demonstrate the extent of any changes in time (including any Deterioration), including (where applicable) temporal trend analysis and the pairwise data comparison of differences between upstream and downstream sites; and
 - e. to require the Consent Holder to prepare a Remediation and Response Plan in consultation with Te Rūnanga o Arowhenua following any identified Deterioration that includes:
 - i. requiring the Consent Holder to manage nutrient losses that are determined to be contributing to any identified Deterioration in a manner that is consistent with improving water quality over time and having a reduction in any adverse effects on aquatic life; and
 - ii. reviewing individual Property Farm Environment Plans or *Certified Freshwater Farm Plans* (as might apply) through the EMS programme where it is determined those farming activities are contributing to any identified Deterioration.

Catchment groundwater monitoring

- 23 a. Subject to Condition 26, the Consent Holder shall undertake (either directly or through a catchment group) water quality sampling on a minimum of 10 bores at the locations generally shown on attached Plan CRC185469X, with all bores being sampled quarterly for nitrate-nitrogen in accordance with the requirements of the *National Environmental Monitoring Standards Water Quality – Part 1 Groundwater* dated March 2019.

Localised surface water monitoring

- b. Subject to Condition 26 the Consent Holder shall undertake (either directly or through a catchment group) surface water quality monitoring in the following waterbodies at the locations generally shown on attached Plan CRC185469Y:
- i. Wakanui Stream;
 - ii. Mt Harding Creek;
 - iii. Ashburton River South Branch at Digbys Bridge; and
 - iv. any further or alternative location(s) that may be determined through the review of the Environmental Monitoring Programme that is to be undertaken in accordance with Condition 26, and such surface water monitoring shall include monitoring of the contaminants listed in Table CRC185469-2, with:
 - A. monitoring to occur at the frequencies included in column 2 of Table CRC185469-2; as may be amended in accordance with condition 26 to 28; and
 - B. where specified in column 3 of Table CRC185469-2, monitoring being undertaken for contaminants to determine a Base Attribute State, calculated for each monitoring site once the five years of monitoring required by Condition 22(c) is complete, provided that in the case of:
 1. Mt Harding Creek and the Ashburton River South Branch, monitoring shall include all contaminants listed in Table CRC185469-2; and
 2. the Wakanui Stream, monitoring shall be limited to Nitrate, Periphyton (where suitable hard bottom substrate is present), and Macrophytes.
 3. the Ashburton River North Branch, the determination of any base attribute state, any Deterioration and any further monitoring required by Condition 22(d) shall have regard to the varying and intermittent nature of flows (such that it may be necessary to exclude some data from low/no flow events).

Table CRC185469-2

Contaminant	Frequency of sampling	Base Attribute State	Deterioration
Nitrate toxicity mg NO ₃ - N mg/L	Monthly	Median and 95 th percentile of previous 5 years' data.	Where the annual (1 July to 30 June) median and/or 95 th percentile NO ₃ - N mg/L are greater than the calculated base attribute state.
Dissolved reactive phosphorous DRP mg/L	Monthly	Median and 95 th percentile of previous 5 years' data.	Where the annual (1 July to 30 June) median and/or 95 th percentile DRP mg/L are greater than the calculated base attribute state.
<i>Escherichia coli</i> E. coli/100ml	Monthly	The attribute band as calculated in accordance with the Table 9 of the NPSFM 2020 (August 2020) and using 5 years of data	Where the attribute band (as per the NPSFM 2020) is worse than the calculated base attribute state (using 5-year rolling data).
Macroinvertebrates	Annually between December and March (inclusive) (QMCI or MCI using NEMS 2020 methodology)	The median attribute band as calculated in accordance with Table 14 of the NPSFM 2020 (August 2020) and using 5 years of data.	Where the attribute band (as per the NPSFM 2020) is worse than the calculated base attribute state (using annual data)
Deposited fine sediment (percentage cover)	Monthly	The attribute band as calculated in accordance with Table 14 of the NPSFM 2020 (August 2020) and using 5 years of data.	Where the attribute band (as per the NPSFM 2020) is worse than the calculated base attribute state (using 5-year rolling data).
Periphyton (percentage cover and chlorophyll-a)	Monthly	Not applicable for percentage cover For Chlorophyll-a: the attribute band as calculated using 5 years of data in accordance with Table 2 of the NPSFM 2020 (August 2020).	Not applicable for percentage cover For Chlorophyll-a: where the attribute band (as per the NPSFM 2020) is worse than the calculated base attribute state (using 5-year rolling data).
Macrophytes (percentage cover)	Monthly	Not applicable	Not applicable

Advisory note 1: The Base Attribute State(s) are based on the attribute bands and attribute states in Appendix 2A of the National Policy Statement for Freshwater Management 2020 (August 2020).

Advisory note 2: Where water quality sampling is undertaken as part of a catchment group, members of the group may seek to rely on the same groundwater monitoring bores or surface water monitoring sites as part of their respective consent requirements.

Advisory note 3: The 'Base Attribute State' (numeric) for nitrate will be calculated as the maximum of annual median and the maximum of annual 95 percentiles from the first five years of numeric attribute states calculated from monthly data.

- 24 The Consent Holder shall continue to implement the Environmental Monitoring Programme in place at the Commencement Date and as required by this consent. The Consent Holder shall provide by 1 December each year;
- a. a copy of all water quality sample data undertaken during the previous period of 1 July to 30 June shall be provided to the Canterbury Regional Council in a format as advised by the Compliance Manager, Canterbury Regional Council suitable for automated upload to the Council's water quality database software; and
 - b. a summary within the annual report each year that sets out the results of all sampling undertaken over the previous period 1 July to 30 June, including a discussion on:
 - i. the results of any further analyses undertaken in accordance with condition 22(d);
 - ii. the extent to which there has been an identified Deterioration; and
 - iii. for contaminants where a Deterioration is not defined (being Periphyton and Macrophytes percent covers), the nature of any changes over time, including any unexpected declines.
- 25 In the event that there is a Deterioration that is identified as a part of the water monitoring required under Conditions 22(c), (d) and 23(b), the Consent Holder (either directly or through a catchment group) shall, within one month of the Deterioration first being identified, engage a suitably qualified and experienced person for the purposes of preparing a Remediation and Response Plan. The Remediation and Response Plan shall:
- a. discuss the potential causes of the Deterioration, and the extent to which they might be attributable to the activities on farmland under the management of this resource consent;
 - b. advise on any changes that might be made to a Farm Environment Plan or Management Plan for Farming Activities for the Properties included in Schedule CRC185469A, on the basis that any changes will be proportionate to the relative contributions of those Property(ies) to the Deterioration;
 - c. advise how nutrient discharges may be further managed to ensure improving water quality and a reduction in any adverse effects on aquatic life over time;
 - d. advise on any further or amended monitoring that may be required to better understand the Deterioration (and the timeframes for that monitoring);
 - e. remain in place and be subject to regular reviews for the duration of any Deterioration, as might be identified through further monitoring;

- f. be prepared in consultation with Te Rūnanga o Arowhenua; and
 - g. be completed within six months of the Deterioration being identified (or such other time as may be agreed to by the Compliance Manager, Canterbury Regional Council) and the Consent Holder shall implement any recommendations. A copy of the completed Remediation and Response Plan shall be provided to Te Rūnanga o Arowhenua and Attention Compliance Manager, Canterbury Regional Council as a part of the annual reporting required under Condition 29.
- 26 The Consent Holder shall undertake a review of the groundwater and surface water monitoring required under Condition 23:
 - a. in the six month period that is prior to 1 December 2027, being a date before the Base Attribute State is anticipated to have been determined for all listed contaminants,
 - b. at any other time that may be determined by the Consent Holder; including but not limited to any amendments to the attribute states provided for in the National Policy Statement for Freshwater Management 2020 (or successor documents); or
 - c. on making any change to ScheduleCRC185469A that results in increasing the area managed by the scheme on a Property or adjoining Properties by more than 200 hectares over that occurring at the Commencement Date, provided that in the case of a review under this Condition 26(c), the review shall be limited to the effects of the change and the need to consider further groundwater and/or surface water monitoring sites.
- 27 If the Consent Holder is required to or elects to undertake such a review under Condition 26, the Consent Holder will engage a suitably qualified and experienced person to:
 - a. Advise on any changes that might be made to add, remove or amend:
 - i. Groundwater monitoring bores;
 - ii. Surface water monitoring sites;
 - iii. Contaminants;
 - iv. the Base Attribute State(s) in Table CRC185469-2 and how they are determined;
 - v. the analyses required by Condition 22(d)
 - vi. how a Deterioration is determined; and
 - vii. Sampling frequency,
 - b. Prepare a Water Monitoring Amendment Report that:
 - i. Outlines the reasons for the change(s)proposed; and
 - ii. Confirms that the additional, removal or amendment will continue to enable the Consent Holder to meet the objectives set out in Condition 22;
 - iii. Consult with the Compliance Manager, Canterbury Regional Council in the preparation of the Water Monitoring Amendment Report; and
 - iv. Provide a copy of the of the Water Monitoring Amendment Report to the Compliance Manager, Canterbury Regional Council for certification that any change(s) proposed meet the requirements of this Condition 27 and the objectives outlined in Condition 22.

- 28 The Consent Holder shall only implement the change(s) proposed to the monitoring required in Condition 23 if written certification is provided by the Compliance Manager, Canterbury Regional Council that the changes meet the requirements of Conditions 22 and 27.

General Reporting

- 29 The Consent Holder shall prepare an annual report describing the results of the ASM programme and the audits that have been conducted each year. The report shall include a summary of the FEP Auditing programme for the completed year preceding the reporting period, including the following:
- a. the name of the FEP auditor(s);
 - b. an aggregated summary of the audit performance grading, including the farming activity parameters on the properties graded;
 - c. the number of Properties receiving each audit grade;
 - d. the number of properties which have received repeated fail grades (being C or D grades in relation to a Farm Environment Plan or any fail grade as maybe determined in consultation with the Compliance Manager, Canterbury Regional Council in relation to any Certified Farm Environment) in the past five years (including a summary of the reasons and actions taken);
 - e. the total annual calculated loss of nitrogen from all Properties within the Command Area over the reported year, in accordance with the method outlined in Schedule CRC185469B, and including information on:
 - i. the load that has been calculated or deemed for each Property in accordance with Conditions 3 to 6;
 - ii. any change in the Nutrient Calculation methodology, including a description of the nature of the change and how previously reported loads are to be considered under any new Nutrient Calculation.
 - iii. the total aggregated NDA for each Nutrient Allocation Zone, being the sum of the assessed nitrogen losses from all Properties provided for in Conditions 4(a) and (b) and identified in the relevant part of Schedule CRC185469A; and
 - iv. predicted changes in average nitrogen concentrations beyond the root zone.
 - f. the reporting on environmental monitoring required in accordance with Condition 24;
 - g. a summary of any Material Change applications considered in accordance with Condition 11;
 - h. the performance of Properties in the scheme in meeting the environmental targets and objectives as specified in the Farm Environment Plans required by Condition 17(a); and
 - i. results of the review required by Condition 15.
- 30 A copy of the annual report required under Condition 29 shall be provided to Te Rūnanga o Arowhenua and the Compliance Manager, Canterbury Regional Council, by 1 December each year.

- 31 The reporting requirements in Conditions 29 and 30 may be altered with the agreement of the Compliance Manager, Canterbury Regional Council to reflect the timing of the consent implementation between this consent and existing consent CRC183851.

Advisory note: The intention of Condition 31 is to ensure that the Consent Holder is able to rely on resource consent CRC183851, this consent, or a combination of the two for a transitional period, as might be agreed, for the purposes of ensuring the Consent Holder can avoid unnecessary duplication of reporting requirements and where necessary, complete or dispense with annual reporting requirements where they may be covered by one of more resource consent.

Review

- 32 The Canterbury Regional Council may once per year, on any of the last five working days of Mayor November, serve notice of its intention to review the conditions of this consent for the purposes of:
- a. dealing with any adverse effect on the environment which may arise from the exercise of the consent; and
 - b. addressing the failure of any Remediation and Response Plan to achieve the improvements anticipated in the plan in relation to water quality.

Joint Compliance

- 33 The Consent Holder may, in consultation the Compliance Manager, Canterbury Regional Council combine the obligations in this resource consent with any other resource consent held by the Consent Holder that provides for similar or the same obligations.

Further Advisory Note:

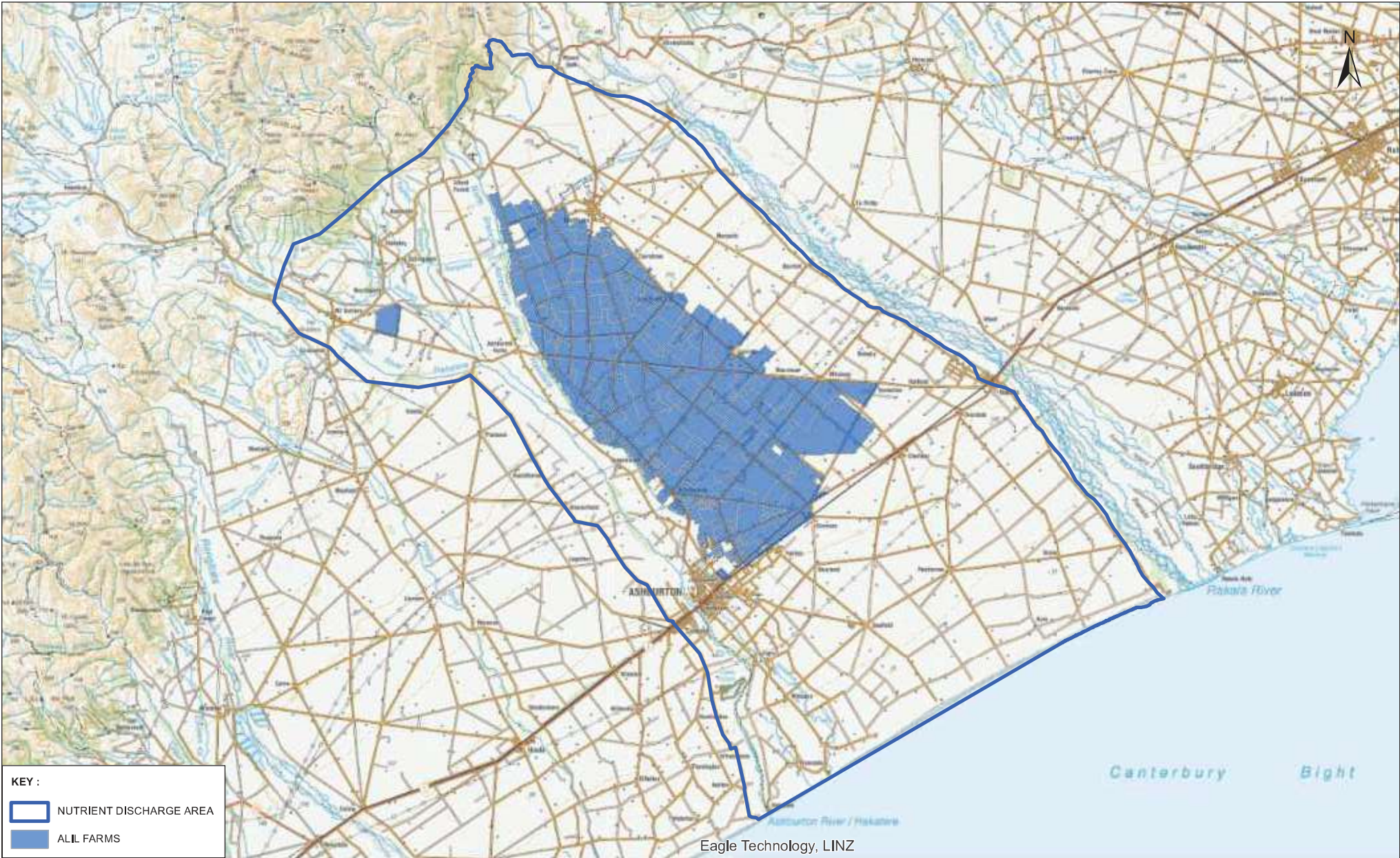
Addition and removal of Properties to and from the Schedule CRC185469A is at the sole discretion of the Consent Holder.

Issued at Christchurch on 10 August 2026

Canterbury Regional Council

PLAN CRC185469A: Nutrient discharge area and ALIL Farms

ASHBURTON LYNDHURST IRRIGATION LTD



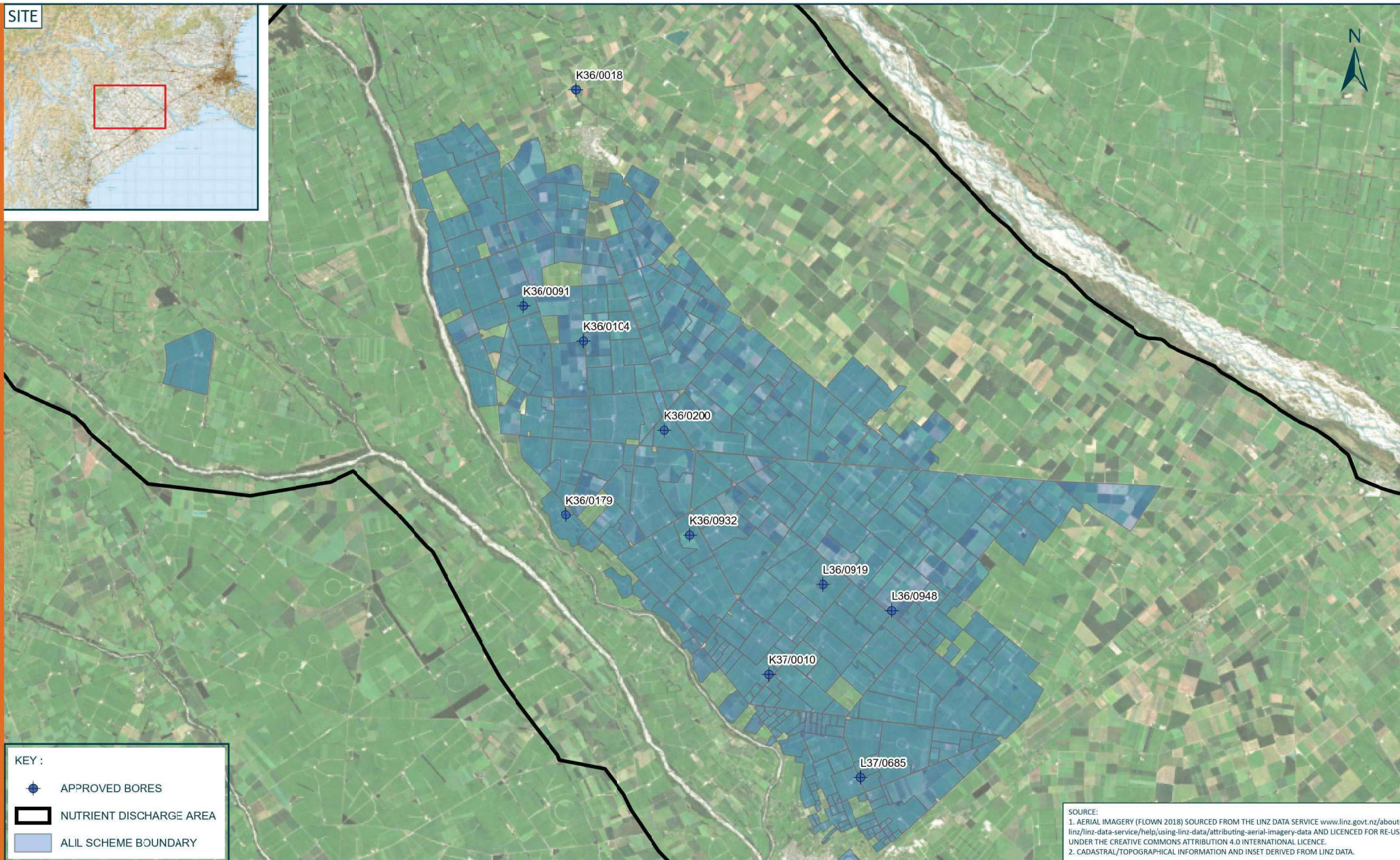
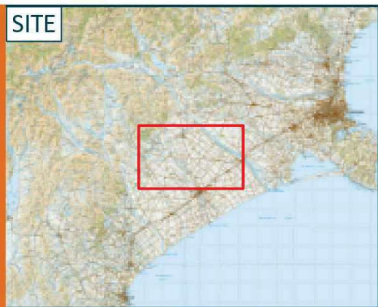
KEY :

-  NUTRIENT DISCHARGE AREA
-  ALIL FARMS

SOURCE:
1. TOPOGRAPHIC MAP DERIVED FROM LINZ DATA.

PLAN CRC185469A

0 5 10 15 20 km



KEY :

- APPROVED BORES
- NUTRIENT DISCHARGE AREA
- ALIL SCHEME BOUNDARY

SOURCE:
 1. AERIAL IMAGERY (FLOWN 2018) SOURCED FROM THE LINZ DATA SERVICE www.linz.govt.nz/about-linz/linz-data-service/help/using-linz-data/attribution-aerial-imagery-data AND LICENCED FOR RE-USE UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 INTERNATIONAL LICENCE.
 2. CADASTRAL/TOPOGRAPHICAL INFORMATION AND INSET DERIVED FROM LINZ DATA.



0 2500 5000
 METRES
 SCALE : 1:200,000 (A4)

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A	ISSUED	MAR 21	MR
NO.	REVISION	DATE	BY



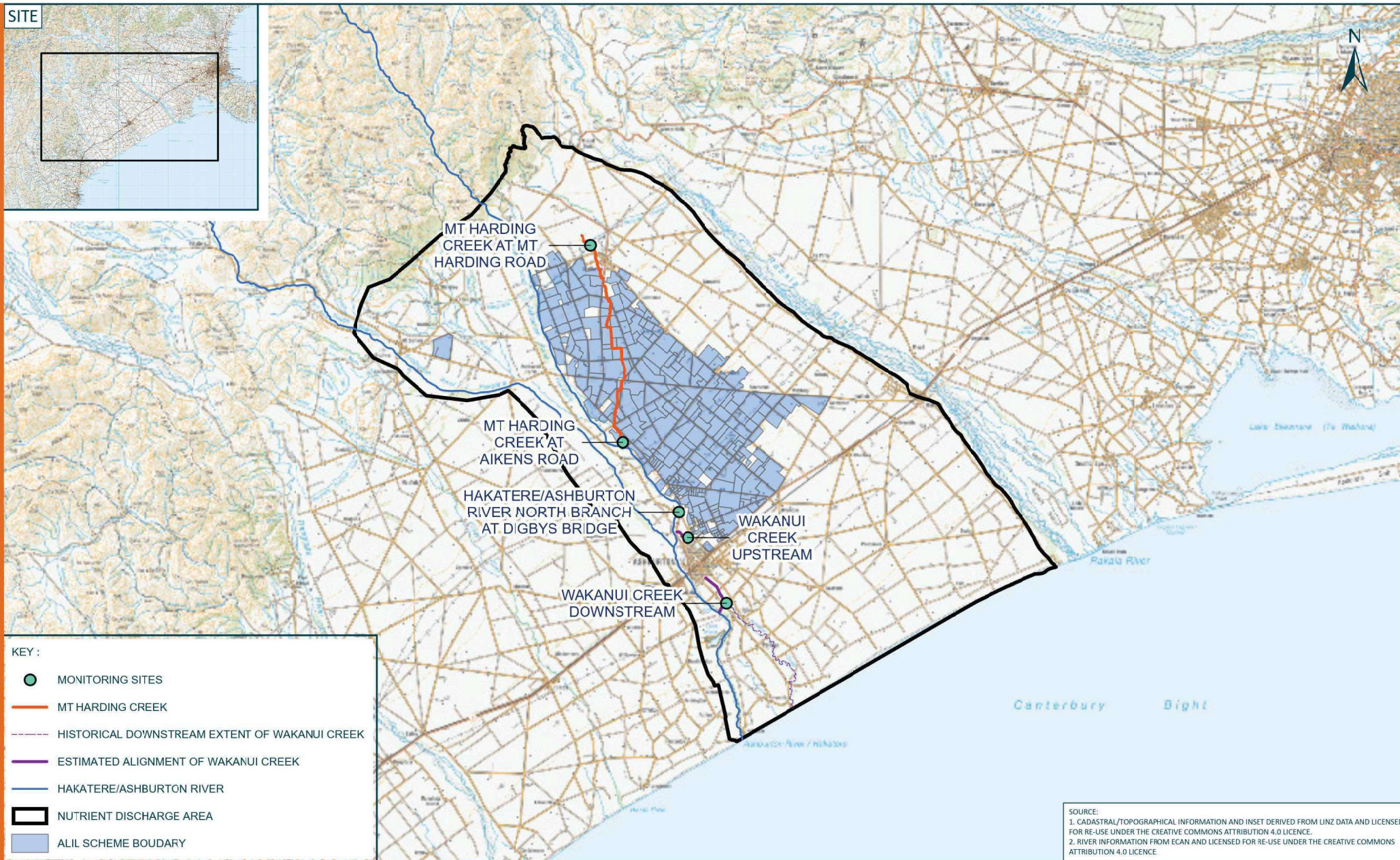
FIGURE

FIGURE 1: GROUNDWATER MONITORING BORES

PROJECT

ALIL SCHEME

PLAN CRC184569X



0 5000 10000
METRES
SCALE : 1:500,000 (A4)

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FOR-ISSUE
28/04/2021

A	ISSUED FOR REVIEW	AFP 21	MR
NO.	REVISION	DATE	BY

CLIENT



FIGURE

PROPOSED SURFACE MONITORING SITES **PLAN CRC184569Y**

PROJECT

AHBURTON LYNDHURST IRRIGATION SCHEME

Schedule CRC185469A

NDA/Property template

Property number	NDA (kg/yr)	
	Nutrient allocation zone A	Nutrient allocation zone B

Memo

Date	24 April 2020
To	Bill Bayfield, Chief Executive
CC	
From	Andrew Parrish, Tania Harris

Recommendation to Approve the Matrix Method as Equivalent Model to Overseer

Introduction

Irrigo Centre Limited (ICL) has developed a model called the Matrix method (also referred to as the Irrigo model) to estimate diffuse nitrogen losses from agricultural activities within Canterbury. ICL requests that the Chief Executive of Environment Canterbury approves the Matrix method as equivalent to Overseer to estimate nitrogen leaching for properties with an aggregated area of greater than 2,500 hectares within the Mid-Canterbury plains.

Other models, such as NCheck, have previously been approved as equivalent models to Overseer and it has been determined that:

- The Chief Executive can approve an alternative model;
- The Chief Executive can limit or restrict this approval; and
- The Chief Executive has the authority to approve an alternative model if equivalent and may consider relevant factors in making the approval.

The power to the Chief Executive is provided for in the definitions of 'nitrogen loss calculation' and 'nitrogen baseline' in the Canterbury Land and Water Regional Plan (LWRP).

We have carefully considered the equivalent model proposed and have worked closely with the applicant to understand the model, and address issues raised about the equivalency of the model to Overseer. After an evaluation of the model by Environment Canterbury staff, we are confident that we can recommend to you that the Matrix method is equivalent to Overseer for the purpose of calculating total nitrogen loads for irrigation schemes and other groups of properties in Mid-Canterbury.

We recommend that the model is only approved for use in limited circumstances, recognising that the model is not considered equivalent for other purposes, such as assessing localised environmental effects. This will be addressed through the associated resource consent process.

We further recommend that the model is recalibrated once every 4 years, and if the model does not calibrate against the most recent version of Overseer, additional farms are able to

be added to the model. This gives us confidence that over time the model will remain equivalent to Overseer.

We have included the proposed approval text in Attachment 1, which sets out the limited circumstances recommended for the approval.

An assessment of the equivalence of the Matrix method is contained in Attachment 2. In summary, for the circumstances proposed for the use of the Matrix method, it is considered to be an equivalent model because:

- Both Overseer and the Matrix method provide an estimate of nitrogen loss below the root zone, and the key inputs and drivers of nitrogen losses are the same.
- The Matrix method uses the Overseer model.
- The Matrix Method will result in an equivalent outcome in terms of determining a total scheme load.
- The Matrix method can be updated to incorporate new land uses or practices if they change over time (in accordance with an agreed process as outlined in Appendix 2 of the application for approval of an equivalent model¹).

Recommendation:

That the Chief Executive of Environment Canterbury approves 'the Matrix method' as an equivalent model to Overseer for use in limited circumstances within the Mid-Canterbury plains as follows:

1. The Matrix method is only used to estimate the nitrogen baseline and nitrogen loss calculation to determine aggregated nitrogen loads for groups of properties with a minimum area of 2,500 hectares within the Mid-Canterbury plains.
2. The Matrix method is only used in the context of a resource consent and Environmental Management Strategy.
3. The Matrix method is recalibrated against Overseer files every four years.

29 April 2020



Andrew Parrish, Regional Planning Manager



Tania Harris, Senior Manager Operational Support

¹ Letter to Chief Executive of Environment Canterbury, 'Summary of the Matrix Methodology for Calculating Nitrogen Losses (v4)', 22 April, 2020.

Attachment 1: Approval of Equivalent Model

1. The definitions of nitrogen baseline and nitrogen loss calculation in the Canterbury Land and Water Regional Plan require the discharge of nitrogen below the root zone to be modelled with Overseer or an equivalent model approved by the Chief Executive of Environment Canterbury.
2. Irrigo Centre Limited have developed an alternative model called 'the Matrix method' for the purposes of determining the aggregated nitrogen baseline and nitrogen loss calculation in particular circumstances.
3. Technical information about the Matrix method, including the process for amendments to the model, is outlined in the application to the Chief Executive for approval of the equivalent model, titled 'Summary of the Matrix Methodology for Calculating Nitrogen Losses (v4)', 22 April, 2020.
4. The particular circumstances where 'the Matrix Method' is approved for use as a model equivalent to Overseer under the Canterbury Land and Water Regional Plan, are as follows:
 - a. Within the Mid-Canterbury plains, between the Rangitata and Rakaia Rivers, up to the foothills of the mountains, for groups of properties with a minimum combined area of 2,500 hectares.
 - b. To be used only in the context of a resource consent to:
 - i. generate an aggregated nitrogen baseline or nitrogen discharge allowance for the groups of properties; and
 - ii. generate an aggregated nitrogen loss calculation to determine compliance with consented nitrogen loss limits.
 - c. Where the Matrix method is recalibrated against Overseer files every four years.
 - d. The approval is in effect until 30 April 2035.
5. Any proposed amendments to the Matrix method shall be submitted to Environment Canterbury for consideration before being implemented:
 - a. The amendments shall be considered by a panel made up of representatives of the Consents, Planning, Science and Compliance Monitoring sections of Environment Canterbury.
 - b. Within 30 working days of receiving the proposed amendments the panel shall make a recommendation to the Chief Executive for consideration.

- c. Upon receiving the recommendation, the Chief Executive shall make a decision on the proposed amendments within 14 working days and notify all parties within 5 working days of making the decision.
6. In giving this approval I have considered the information set out in the attached information and I am satisfied that 'the Matrix Method' is an equivalent model to Overseer in the particular circumstances outlined in this approval.

A handwritten signature in black ink, appearing to read 'Bill Bayfield', written in a cursive style.

Bill Bayfield, Chief Executive

29 April 2020

Attachment 2: Equivalence Assessment

Introduction

Irrigo Centre Limited (ICL) has developed a model called the Matrix method (also referred to as the Irrigo model) to estimate diffuse nitrogen losses from agricultural activities within Canterbury. ICL requests that the Chief Executive of Environment Canterbury approves the Matrix method as equivalent to Overseer to estimate nitrogen leaching for properties with an aggregated area of greater than 2,500 hectares within the Mid-Canterbury plains.

The Application and context

The applicant has described the Matrix method as a catchment model used to calculate nitrogen losses for groups of properties within Canterbury. ICL acknowledges that the Matrix method is not a suitable replacement of Overseer nutrient budgets on an individual farm basis². ICL consider that the minimum catchment size that the model is suitable for is 2,500 hectares based on their calibration of the model.

The Land and Water Regional Plan (LWRP) definitions for nitrogen baseline and nitrogen loss calculation require that they are set using Overseer or an equivalent model approved by the Chief Executive of Environment Canterbury. If approved as an equivalent model, the Matrix method would be used to set nitrogen loss limits on future resource consents and to assess compliance with those limits.

The LWRP does not define the word “equivalent”. In making this recommendation the meaning of equivalent is based on the Online Merriam-Webster dictionary which defines equivalent as: 1. equal in force, amount, or value; 2. like in signification or import; 3. corresponding or virtually identical especially in effect or function.

This recommendation assesses whether the proposed Matrix method is equivalent to Overseer for the purpose of the nitrogen baseline and nitrogen loss calculation definitions in the LWRP.

Assessment

Legal advice has recommended five criteria to consider when making the decision on whether the model is equivalent to Overseer:

1. Consideration of what the model actually does.
2. A comparison between the input parameters used for Overseer and those used for the Matrix method.
3. The proposed use of the Matrix method, including the planning context within which the Matrix method will be used and any limitations of that use.
4. An assessment between the two models in the context of the proposed use.

² This is because there is significant variation in nitrogen loss calculations at a property scale due to individual properties undertaking activities which are different to that described in representative files.

5. Any environmental consequences (and whether they are neutral in light of the proposed use).

The Matrix method is assessed against the five criteria below.

1. Consideration of what the model actually does.

Both models provide an estimate of the amount of nitrogen leached below the root zone using Overseer. Therefore, they are similar in what they do, but use a different method to achieve this. Overseer provides the estimate based on farm-specific information and applying a number of mathematical equations tracing the movement of nutrients within a farm system. It provides an estimate of nitrogen leached on a per property basis expressed in kg per hectare per year. Updates to the Overseer model are provided for in the definitions of nitrogen baseline and nitrogen loss calculation in the LWRP.

While the regional rules within the LWRP require farmers to operate at or below Good Management Practice (GMP) loss rates from specified dates, the Overseer model itself does not estimate good management practice loss rates. This is achieved through the Farm Portal which modifies uploaded Overseer analyses to reflect GMP.

The Matrix method works by overlaying the most representative soil type, land use and irrigation type to determine the appropriate 'representative farm' Overseer analyses. These representative farms have been prepared at six levels of management practice standard³. The Matrix method calculates the aggregated nitrogen loss rate by applying the appropriate representative analyses at the appropriate level of management standard.

To determine compliance with nitrogen load limits, the Matrix method includes an additional step to Overseer where the Farm Environment Plan (FEP) audit grade is used to determine the standard of management practice, which is used to calculate the nitrogen loss rate. The Matrix method is illustrated in the diagram below which was provided by ICL.

Summary of Layers Used to Calculate Nitrogen Losses (Figure 2 of the ICL application).



In summary, the models are similar in terms of what they do, given that for both models the purpose is to provide an estimate of the amount of nitrogen leached below the root zone.

³ Baseline, Hinds Plains Zone good management practice, Irrigation GMP, Fertiliser GMP, Irrigation and Fertiliser GMP and Advanced Mitigation.

Overseer provides this estimate at a farm scale (and then those estimates can then be combined to determine losses at a catchment scale), whereas the Matrix method provides an estimate at a catchment scale, for catchments greater than 2,500 hectares.

2. A comparison between the input parameters used for Overseer and those used for the Matrix method.

The Matrix method uses Overseer as the basis to estimate nitrogen losses and in this regard, it uses the same inputs as Overseer. However, the difference is that Overseer uses input data for each individual farm for the relevant time period (the nitrogen baseline period or past four years). The Matrix method proposes to use base datasets for representative farms where Overseer has been used to estimate nitrogen losses. Given this, Overseer provides for a higher level of specificity with respect to data inputs. The use of representative farms in the Matrix method introduces a level of coarseness and potential inaccuracy.

In addition, the Matrix method uses the FEP audit grade and the level of confidence in certain areas to determine the nitrogen loss calculation for the farm, rather than as one of the matters to be considered in determining the audit grade.

While there are differences in data inputs, the inputs which affect the overall nitrogen loss calculation, such as soil type and land use, are the same for both models, in that for both Overseer and the Matrix method, these will be the key drivers for changes to N loss calculations.

3. The proposed use of the Matrix method, including the planning context within which the Matrix method will be used and any limitations of that use.

The applicant proposes to use the nitrogen leaching limits estimated by the Matrix method to:

- a. Set nitrogen loss limits for future resource consents for activities in the Ashburton Plains area; and
- b. Assess compliance of irrigation schemes, collectives and farming enterprises with these limits.

For areas subject to the regional rules, the LWRP now requires farmers to operate at nitrogen loss rates that reflect industry-agreed Good Management Practice. This requirement was introduced through Plan Change 5 to the LWRP, which introduced new definitions of 'Baseline GMP Loss Rate' and 'Good Management Practice Loss Rate' which require reductions in nitrogen loss to rates that reflect GMP. The requirements vary for sub-regions. In the Hinds catchment further reductions are required to achieve the water quality outcomes specified in the LWRP, and therefore any equivalent model to Overseer will need to be able to determine if these reductions have been achieved.

The LWRP provides for the use of equivalent methods to Overseer in limited and specified circumstances to calculate a nitrogen baseline or a nitrogen loss calculation. While the calculation of the Good Management Practice Loss Rate and Baseline GMP Loss Rate do not require approval from the Chief Executive, they are related in that the model used to

calculate the nitrogen baseline and nitrogen loss calculation will determine *how* the GMP loss rates are calculated (using the Farm Portal if Overseer has been used, and by reference to the audit grade if the Matrix method has been used).

In relation to the planning context it is noted that the LWRP encourages irrigation scheme initiatives to improve land and water use practices and meet water quality outcomes (Policy 4.36).

4. An assessment between the two models in the context of the proposed use.

This assessment of whether the Matrix method is equivalent to Overseer focusses on the use of the model to estimate the nitrogen baseline and nitrogen loss calculation, given these are the only situations where the LWRP provides for an equivalent method to be used (subject to the approval of the Chief Executive).

Importantly, the approval of an equivalent model for the purposes of the nitrogen baseline and nitrogen loss calculation definitions are different to the rules in the LWRP that provide an alternative pathway where the Farm Portal is unable to generate a Baseline GMP Loss Rate or Good Management Practices Loss Rate.

Nitrogen baseline

The nitrogen baseline is defined in the LWRP. In summary it is the discharge of nitrogen below the root zone, modelled in accordance with Overseer (where the data is inputted into the model in accordance with Overseer Best Practice Data Input Standards) or an equivalent model, averaged over the four-year period from 2009 to 2013, expressed in kg/ha/yr for an identified area of land. The definition provides for the nitrogen baseline to be recalculated with the most recent version when Overseer is updated.

Nitrogen loss calculation

The nitrogen loss calculation is similar to the nitrogen baseline but is averaged over the most recent four-year period. Overseer version changes are also provided for in the nitrogen loss calculation definition.

In the context of these definitions, Overseer and the Matrix method can both estimate the nitrogen baseline and nitrogen loss calculation (i.e. the loss of nitrogen below the root zone for either the 2009-2013 period, or the most recent four-year period). However, there are some key differences as follows:

- a. Overseer estimates nitrogen loss rates on a per property basis, whereas the Matrix method estimates losses on a catchment scale and is not suitable for individual farms. Calculating nitrogen losses at a catchment scale for irrigation schemes is consistent with the policy framework of the LWRP.
- b. Overseer updates are provided for by the LWRP. For the Matrix Method, Irrigo have proposed a process for updates to the model, which provides for:

- i. Comparing Overseer and Matrix nitrogen losses for a sample of farms every four years⁴ and recalibrating the model if it deviates from Overseer nutrient budgets by more than 10%;
 - ii. Updating the Matrix into later versions of Overseer; and
 - iii. Other updates to incorporate new files and management standards into the Matrix.
- c. Given that Overseer inputs are based on actual farm data, any land use changes on the farm within the relevant four-year period are taken into account. Given that the Matrix method uses representative farm systems, it may not capture actual land use changes within this four year period when determining the nitrogen baseline or nitrogen loss calculation, particularly where those changes reflect farm systems that do not easily correlate with the model farm files.
- d. The Matrix method estimates losses on a catchment scale and it is not clear how nitrogen loss limits will apply when individual farms leave or join an irrigation scheme given that the Matrix method is not appropriate at an individual farm level. The LWRP requires that farmers generate a property-specific loss rate to obtain a Farming Land Use consent. It is understood that the number of farms leaving the schemes is expected to be low (if any), and therefore this is not considered to be a significant issue. For associated properties joining the scheme (i.e. not irrigated by the scheme but owned by a scheme shareholder), they are required to estimate the nitrogen baseline when joining the scheme, which addresses this issue for associated properties.
- e. The LWRP requires reductions in nitrogen loss in the Hinds catchment to achieve water quality outcomes. Overseer estimates can be used to calculate reductions in nitrogen loss at a farm scale whereas the Matrix method can only calculate reductions at a catchment scale. This difference is not considered to be significant, as calculating reductions at a catchment scale will meet the policy requirements for the Hinds catchment.
- f. In regard to determining the good management practice loss rate, the planning framework relies on the Farm Portal to modify Overseer files to reflect GMP, whereas the Matrix method uses the audit grade for the irrigation and nitrogen fertiliser targets to determine the appropriate GMP representative file. An internal CRC review of the Matrix method GMP files has confirmed that the files meet the requirements of the LWRP, although they may require regular review and refinement to ensure that they remain consistent with the LWRP requirements.

ICL calibrated the Matrix method by comparing nitrogen loss estimates for 94 farms within the three irrigation scheme areas. Based on the initial analysis, ICL stated that the Matrix overestimates average nitrogen losses compared to Overseer by 3.6%⁵. ICL acknowledge that there is significant variation between Overseer and Matrix method nutrient loss calculations at a farm scale due to individual properties undertaking different activities to

⁴ Minimum sample size to give 95% confidence of a result within 10% of the true value.

⁵ This is the difference in the average loss rates calculated by Overseer and the Matrix method in kgN/ha/yr.

those described in the representative files. However, they state that variability is managed on a catchment scale through averaging, with 2,500 ha being the minimum catchment size where the Matrix method is appropriate.

To determine if the differences in the models are significant, the calibration data provided by ICI was evaluated further by Environment Canterbury. The initial evaluation found a poor correlation between the two models, and a bias in the model with over prediction of low emitters and under prediction of high emitters. Bias within the model poses a risk to application of the Matrix model to a different dataset, or to predicting the change in losses from changing land uses and practices.

ICI carried out a review of the bias identified by Environment Canterbury, as outlined in Appendix 2 of their application⁶. Their review found:

- Residual analysis using nitrogen load (kgN/yr) instead of loss rate (kgN/ha/yr) results in greater alignment with Overseer nutrient budgets.
- The Matrix slightly overestimates nitrogen loads for higher emitting properties, but the variance with Overseer estimates is still within 10%.
- Small properties were disproportionately represented in the highest variance between the two models.
- Adding the Dryland Arable nitrogen loss figures to the Matrix improves the underestimation of lower intensity properties.

Based on this review, ICL conclude that by completing a residual analysis using the nitrogen load instead of loss rate, and including the Dryland Arable nitrogen loss rates, the bias is reduced sufficiently to ensure that the Matrix is equivalent to Overseer for calculating catchment loads and identifying higher risk land use activities.

Environment Canterbury evaluated ICL's review of the bias and the updated dataset. As part of this evaluation it is noted that comparing loss rates and property loads provides different information. A comparison of loss rates indicates how well the model can match Overseer for a particular activity, irrespective of area, whereas a comparison of the property load indicates how significant the difference is between the models for this application of the model. Both approaches have been evaluated, and it is concluded that:

- A comparison of loss rates (kgN/ha/yr) still shows a bias in the model with overprediction of low emitters and underprediction of high emitters. This confirms that the Matrix method is unable to match Overseer loss rates on an individual property scale.
- The bias in predicting loss rates may be due to rainfall variation which is not accounted for by the model.
- The variance in loss rates between the two models is greater for smaller properties. However, the total loads predicted by the two models are similar because the sample dataset included a wide range of property sizes.

⁶ Letter to Chief Executive of Environment Canterbury, 'Summary of the Matrix Methodology for Calculating Nitrogen Losses (v4)', 22 April, 2020

- Comparing the property loads (kgN/yr) produced by the two models shows a much better fit and less bias compared to loss rates.
- A residual analysis (of the residual difference between the two models compared to Overseer property load) shows less bias than the loss rate per hectare, because of the small property sizes factoring into the bias. That is, the largest errors are occurring on the smallest properties and their contribution to the total load is smaller (than if the differences were occurring on the larger properties).

In summary, Environment Canterbury's review of the model suggests that the Matrix method is suitable to estimate total scheme loads, but it does not match Overseer well enough for predicting loads or loss rates for individual areas or properties. The distribution of property sizes and locations 'average' out errors when considering the schemes as a whole. Validation with a random selection of properties will be essential to ensure this remains true in the future. If the model validation is maintained, there can be some certainty that the total load from the schemes would be similar to that calculated using Overseer.

5. Any environmental consequences (and whether they are neutral in light of the proposed use).

The Ashburton sub-region (excluding the Hinds catchment) is largely comprised of orange and red nutrient allocation zones (NAZ), indicating water quality outcomes are not being met or at risk of not being met for most of this area. The Hinds catchment is a former 'Red NAZ' under the LWRP indicating water quality outcomes are not being met and significant reductions in nitrogen losses are necessary to achieve freshwater outcomes for this catchment. These irrigation schemes currently irrigate around 20% of the total irrigated area in Canterbury. Therefore, any differences between the Matrix method and Overseer nitrogen loss estimates could be significant given the required reductions necessary to achieve the Plan's objectives for water quality. However, Irrigo consider that there is the potential for the use of the Matrix method to achieve better environmental outcomes as a result of the use of the audit grade to inform the final nitrogen loss number, which incentivises farms to improve farm practices.

In the context of the proposed use to estimate a total nitrogen load for groups of properties greater than 2,500 ha, the environmental consequences are considered to be neutral, if validation of the model is maintained. However, the model is not considered to be equivalent for use in other contexts, such as assessing localised environmental effects, and this will be addressed through the associated resource consent process.

Memo

Date	23/4/2020
To	Jacqui Todd
CC	
From	Dan Clark

Updated comparison of loss rate estimates from the Matrix method proposed by Irrigo and those produced by Overseer

I previously evaluated how closely the outputs from the Matrix Method (proposed by Irrigo on behalf of the Mid-Canterbury Irrigation Schemes) compared to those from Overseer. The previous evaluation, dated 16/3/2020, found that the loss rates from the Matrix Method (in kg N/ha/yr) were generally overpredicted for properties with a low loss rate and under predicted for properties with a high loss rate. Overall, both methods produced very similar total loads for the sum of all properties modelled.

Following discussions between Environment Canterbury, Irrigo and representatives of the Mid Canterbury Schemes, some changes were made to the Matrix Model data. These changes meant that the previous evaluation needed to be updated. The updated dataset provided by Irrigo included loss rates and property loads for 181 farms. This is the same dataset as used by Irrigo in Appendix two of their *Summary of The Matrix Methodology for Calculating Nitrogen Losses (v4)*.

Throughout the discussions there has been some disagreement as to whether evaluation should be completed using the loss rates (in kg N/ha/yr) or property loads (in kg N /yr). As these both provide different information. In my previous evaluation I compared loss rates, and in Irrigo's evaluation they compared property loads.

Comparing loss rates indicates how well the model can match Overseer for a particular activity, irrespective of the area covered by that activity. Comparing the property load, indicates how significant the difference is between the models for this application of the model. In this evaluation I provide evaluation of both approaches and describe what the combination of these tell us about the model performance.

The Matrix Method's ability to match Overseers loss rate

Figure 1 shows the loss rates (kg N/ha/yr) produced by the Matrix Method compared to those from Overseer. There is a large amount of scatter in the predictions and generally shows a poor model fit. The R^2 for the trend line in these data is 0.12.

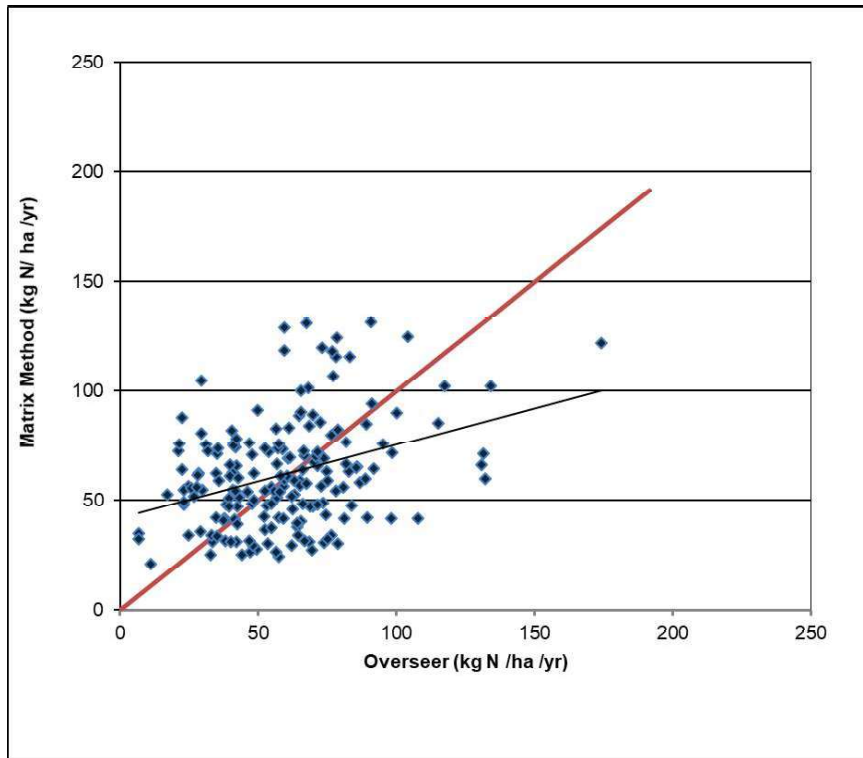


Figure 1 Modelled loss rate in kg N/ha/yr for each model, the trend for these data is shown in black and a one to one line is shown in red

Subtracting the Overseer loss rate from the Matrix Method loss rate provides the residual loss rate for each property, this indicates the how closely the two models are for the property. Figure 2 shows the residual for each property plotted against the Overseer loss rate for that property. This shows the updated model dataset continues to overpredict where the Overseer loss rate is low and underpredict where the Overseer loss rate is high. This confirms the previous evaluations findings, that on an individual property scale the Matrix Model is unable to match Overseer loss rates. Loss rate is important as it is independent of the area and highlights how well the model is performing for different activities. The systematic over and underprediction can be considered as model bias and appears to be related to rainfall. Evaluation of the previous dataset provided by Irrigo indicated that the Matrix Model overpredicted loss rate in the areas with rainfall below 800mm/yr and underpredicted loss rates in areas with rainfall greater than 800 mm/yr.

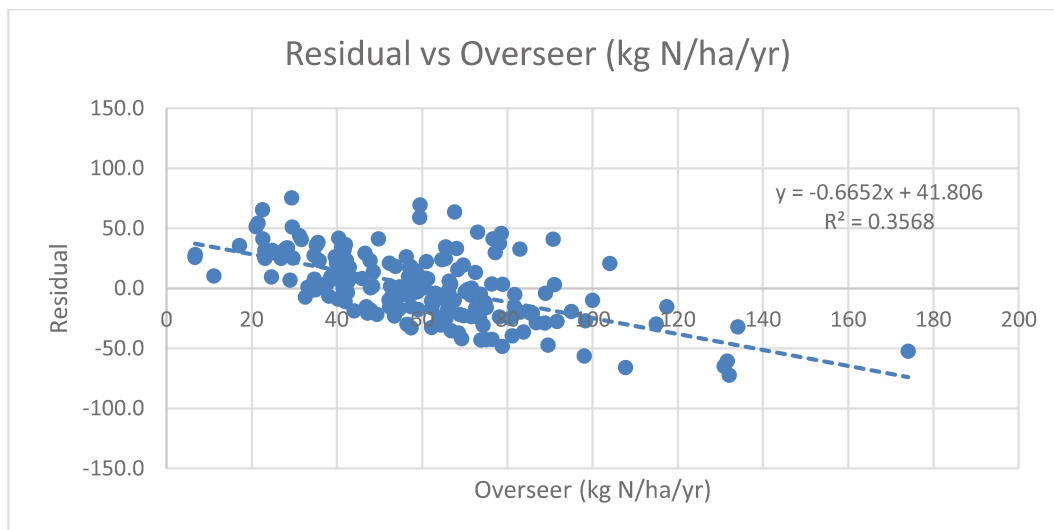


Figure 2 Residual difference between the Matrix Method and Overseer loss rates compared to Overseer loss rate (plot provided by Irrigo)

As the proposed use of the model is to predict total load from the Mid-Canterbury irrigation schemes it is important to know how the inability to predict individual properties impacts on its proposed use. Figure 3 shows the residual loss rate plotted against property size. This shows that the largest errors in the loss rate predictions are occurring with smaller sized properties. This plot also shows that there is not a meaningful trend towards over or underprediction based on property size.

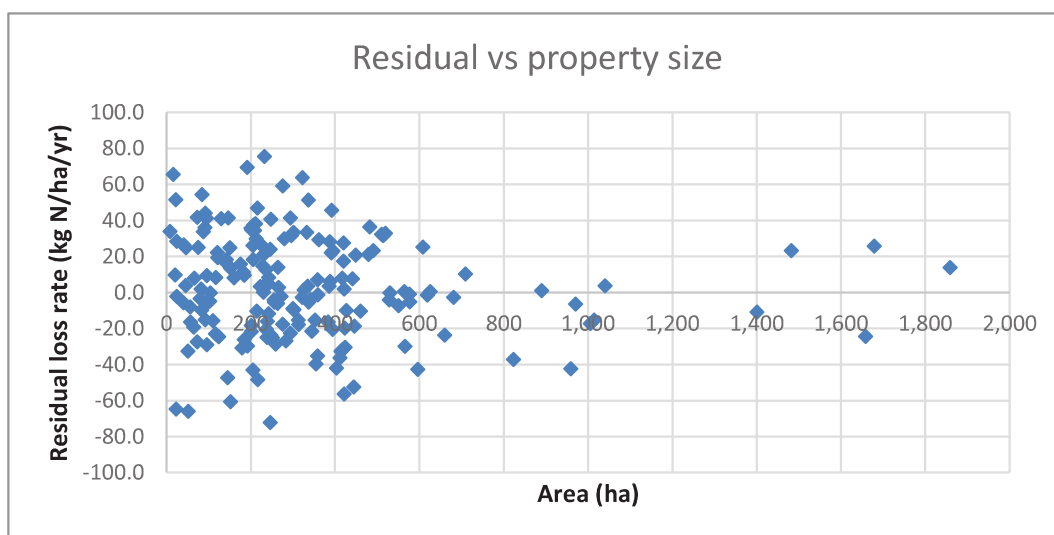


Figure 3 Residual difference between the Matrix Method and Overseer loss rates compared to property size

This analysis indicates that the Matrix Method cannot match the Overseer loss rate for individual properties, and that the error associated with these predictions appears greatest with smaller properties. As the sample dataset used for model validation included a wide range of property sizes these over and under predictions in loss rate resulted in the total loads from both models being very similar.

The Matrix Method's ability to match Overseer property loads

Comparing the property loads produced by the two models combines the impacts of how well the model fits and the impacts of the differing property sizes. As the poorest predictions of loss rate occur on the smallest properties, the fit between the Matrix Method and Overseer property loads is much better. Figure 4 shows the comparison between the total N load per property under the two models, this shows a much closer model fit, compared to the loss rate per ha.

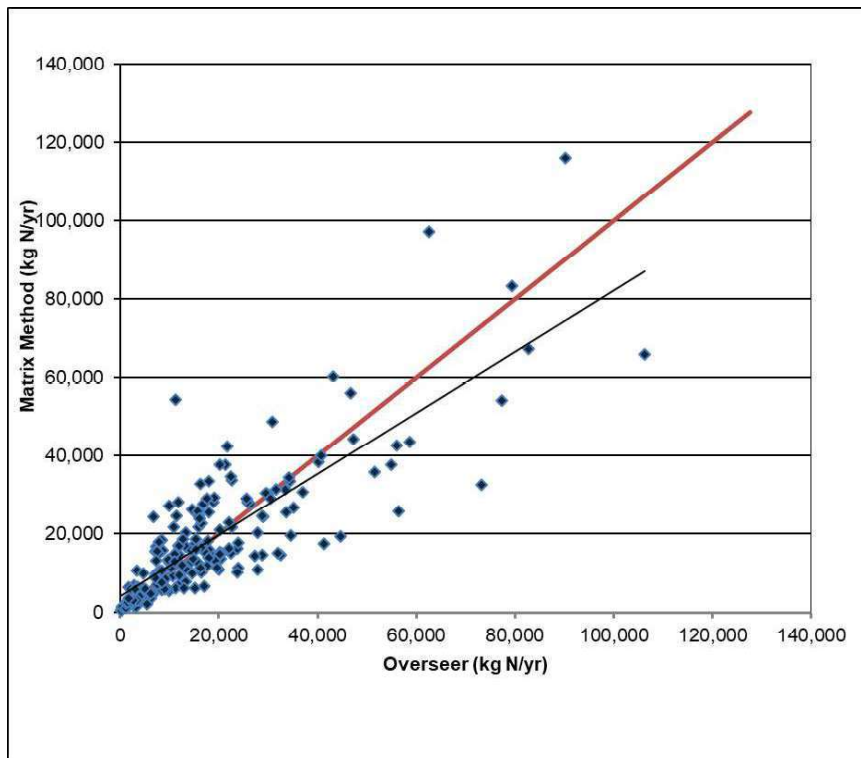


Figure 4 Modelled property load in kg N/yr for each model, the trend for these data is shown in black and a one to one line is shown in red

Repeating the residual analysis using property load results in the plot shown in Figure 5. This shows less bias than the loss rate per ha. This is due to the size of the properties factoring into the analysis. As the largest errors in the model are occurring on the smaller properties their contributions to the total load are smaller than if the largest loss rate errors were occurring over largest areas. As shown in Figure 3 the two models differ most on small properties, but the errors appear evenly distributed. The combination of loss rate and property size result in lower model bias in the predicted property loads and very similar catchment load.

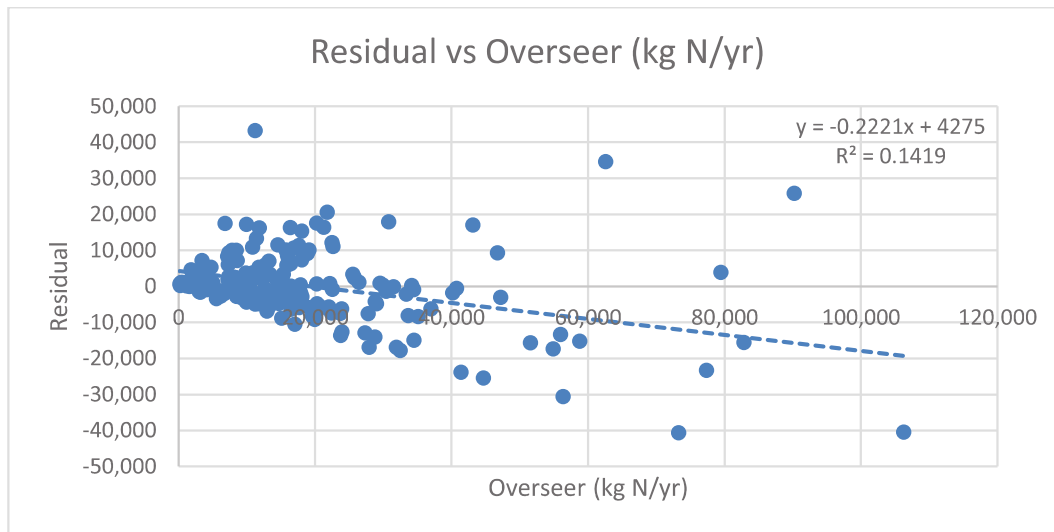


Figure 5 Residual difference between the Matrix Method and Overseer property load compared to Overseer property load (plot provided by Irrigo)

Summary

The overall load from the updated modelled farms is nearly identical between the Matrix Method and Overseer. However, the ability of the Matrix Method to match Overseer loss rates at specific locations remains poor. The distribution of property sizes and locations 'average' out errors when considering the schemes as a whole, but validation with a random selection of properties is essential to ensure this remains true in the future. If the model validation is maintained, there can be some certainty that the total load from the schemes would be similar to that calculated using Overseer.

While the Matrix method may be considered suitable to estimate scheme loads, it is not considered to match Overseer well enough for predicting loss rates or loads for individual areas or properties.

Farm Environment Plan

Management Area – means the areas of farm management practice as set out below:

- (a) Nutrients
- (b) Irrigation
- (c) Cultivation and soil structure
- (d) Collected Animal Effluent and Solid Animal Waste
- (e) Waterbodies (riparian areas, drains, rivers, lakes, wetlands)
- (f) Point sources – offal pits, farm rubbish pits, silage pits
- (g) Water use (excluding water associated with irrigation) – stock water and wash-down water

Objective – means the overarching outcome sought in relation to each Management Area

Target – means a measureable, auditable statement that contributes to achievement of the Objective in each Management Area.

Farm Environment Plan Default Content

The plan requirements will apply to:

- (a) a plan prepared for an individual property or farm enterprise; or
- (b) a plan prepared for an individual property which is part of a collective of properties, including an irrigation scheme, principal water supplier, or an Industry Certification Scheme

The plan shall contain as a minimum:

1. Property or farm enterprise details

- (a) Physical address
- (b) Description of the ownership and name of a contact person
- (c) Legal description of the land and farm identifier

2. A map(s) or aerial photograph at a scale that clearly shows:

- (a) The boundaries of the property or land areas comprising the farming enterprise.
- (b) The boundaries of the main land management units on the property or within the farming enterprise.
- (c) The location of permanent or intermittent rivers, streams, lakes, drains, ponds or wetlands.
- (d) The location of riparian vegetation and fences adjacent to water bodies.
- (e) The location on all waterways where stock access or crossing occurs.

- (f) The location of any areas within or adjoining the property that are identified in a District Plan as “significant indigenous biodiversity”.
- (g) The location of any critical source areas for phosphorus or sediment loss for any part of the property including any land within the High Runoff Risk Phosphorus Zone.
- (h) The location of flood protection or erosion control assets, including flood protection vegetation.
- (i) Public access routes or access routes used to maintain the rivers, streams, or drains.

3. A list of all Canterbury Regional Council resource consents held for the property or farming enterprise.

4A. An assessment of the adverse environmental effects and risks associated with the farming activities and how the identified effects and risks will be managed, including irrigation, application of nutrients, effluent application, stock exclusion from waterways, offal pits and farm rubbish pits.

5. A description of how each of the following objectives and targets for each Management Area, where relevant, will be met and the specific actions that will be implemented to attain the targets.

5A Management Area: Nutrients

Objectives:

- (1) Use nutrients efficiently and minimize nutrient losses to water.

Targets:

- (1A) Available nitrogen loss mitigation measures (excluding those associated with irrigation, fertiliser or effluent management) are implemented.
- (2) Phosphorus and sediment losses from farming activities are minimised.
- (3) Manage the amount, timing and application of fertiliser inputs to match the predicted plant requirements and minimise nutrient losses
- (4) Store and load fertiliser to minimise the risk of spillage, leaching and loss into water bodies.

5B Management Area: Irrigation

Objective:

The amount and timing of irrigation is managed to meet plant demands, minimise risk of leaching and runoff and ensure efficient water use.

Targets:

- (1) New irrigation systems are designed and installed in accordance with industry codes of practice and standards.
- (2) The performance of irrigation systems is assessed annually and irrigation systems are maintained and operated to apply irrigation water at their optimal efficiency.
- (3) The timing and depth of irrigation water applied takes account of crop requirements and is justified through soil moisture monitoring or soil water budgets and climatic information.
- (5) Staff are trained in the operation, maintenance and use of irrigation systems.

5C Management Area: Cultivation and Soil Structures

Objective:

The physical and biological condition of soils is maintained or improved in order to minimise the movement of sediment, phosphorus and other contaminants to waterways.

Targets:

- (1) Farming activities are managed so as to not exacerbate erosion.
- (2) Farming practices are implemented that optimise infiltration of water into the soil profile and minimise run-off of water, sediment loss and erosion.

5D Management Area: Collected Animal Effluent and Solid Animal Waste

Objective:

Animal effluent and solid animal waste is managed to minimise nutrient leaching and run-off.

Targets:

- (1) Effluent systems meet industry Codes of Practice or an equivalent standard.
- (2) The timing and rate of application of effluent and solid animal waste to land is managed so as to minimise the risk of contamination of groundwater or surface water bodies.
- (3) Sufficient and suitable storage is available to enable animal effluent and wash-down water to be stored when soil conditions are unsuitable for application.
- (4) Staff are trained in the operation, maintenance and use of effluent storage and application systems.

5E Management Area: Waterbodies (wetlands, riparian areas, drains, rivers, lakes)

Objective:

Wetlands, riparian areas and the margins of surface waterbodies are managed to avoid damage to the bed and margins of the water body, and to avoid the direct input of nutrients, sediment, and microbial pathogens.

Targets:

- (1) Stock are excluded from waterbodies in accordance with regional council rules or any granted resource consent.
- (2) Vegetated riparian margins of sufficient width are maintained to minimise nutrient, sediment and microbial pathogen losses to waterbodies.
- (3) Farm tracks, gateways, water troughs, self-feeding areas, stock camps wallows and other farming activities that are potential sources of sediment, nutrient and microbial loss are located so as to minimise the risks to surface water quality.
- (4) Mahinga kai values are protected as a result of measures taken to protect and enhance water quality and stream health.

5F Management Area: Point Sources (offal pits, farm rubbish pits, silage pits)

Objective:

The number and location of pits are managed to minimise risks to health and water quality.

Target:

- (1) All on-farm silage, offal pit and rubbish dump discharges are managed to avoid direct discharges of contaminants to groundwater or surface water.

5G Management Area: Water-use (excluding irrigation water)

Objective:

To use water efficiently ensuring that actual use of water is monitored (for water takes of 5 L/s or more) and efficient.

Target:

- (1) Actual water use is efficient for the end use.

The plan shall include for each objective and target in section 5 above:

- (a) detail commensurate with the scale of the environmental effects and risks;
- (b) a description of the actions and Good Management Practices (and a timeframe within which those actions will be completed) that will be implemented to achieve the objectives and targets.
- (c) records required to be kept for measuring performance and attainment of the targets and objectives.

Part C – Farm Environment Plan Audit Requirements

The Farm Environment Plan must be audited by a Certified Farm Environment Plan Auditor who is independent of the farm being audited (i.e. is not a professional adviser for the property) and has not been involved in the preparation of the Farm Environment Plan.

The farming activity occurring on the property will be audited against the following minimum criteria:

1. An assessment of the performance of the farming activity against the objectives, targets, and timeframes specified in the Farm Environment Plan;
2. An assessment of the efficiency of water use (if irrigated).

The Environment Canterbury Certified Farm Environment Plan Auditor Manual sets out the standards and methods to be used by a Certified Farm Environment Plan Auditor to demonstrate proficiency and competency in the auditing of Farm Environment Plans.

Management Plan for Farming Activities

Part A – Management Plans

A Management Plan can be either:

1. A Plan prepared in accordance with the requirements of Part B below; or
2. A Plan prepared in accordance with an industry prepared Farm Environment Plan template that has been certified by the Chief Executive of Environment Canterbury as providing at least an equivalent amount of information and practice guidance contained in Part B below.

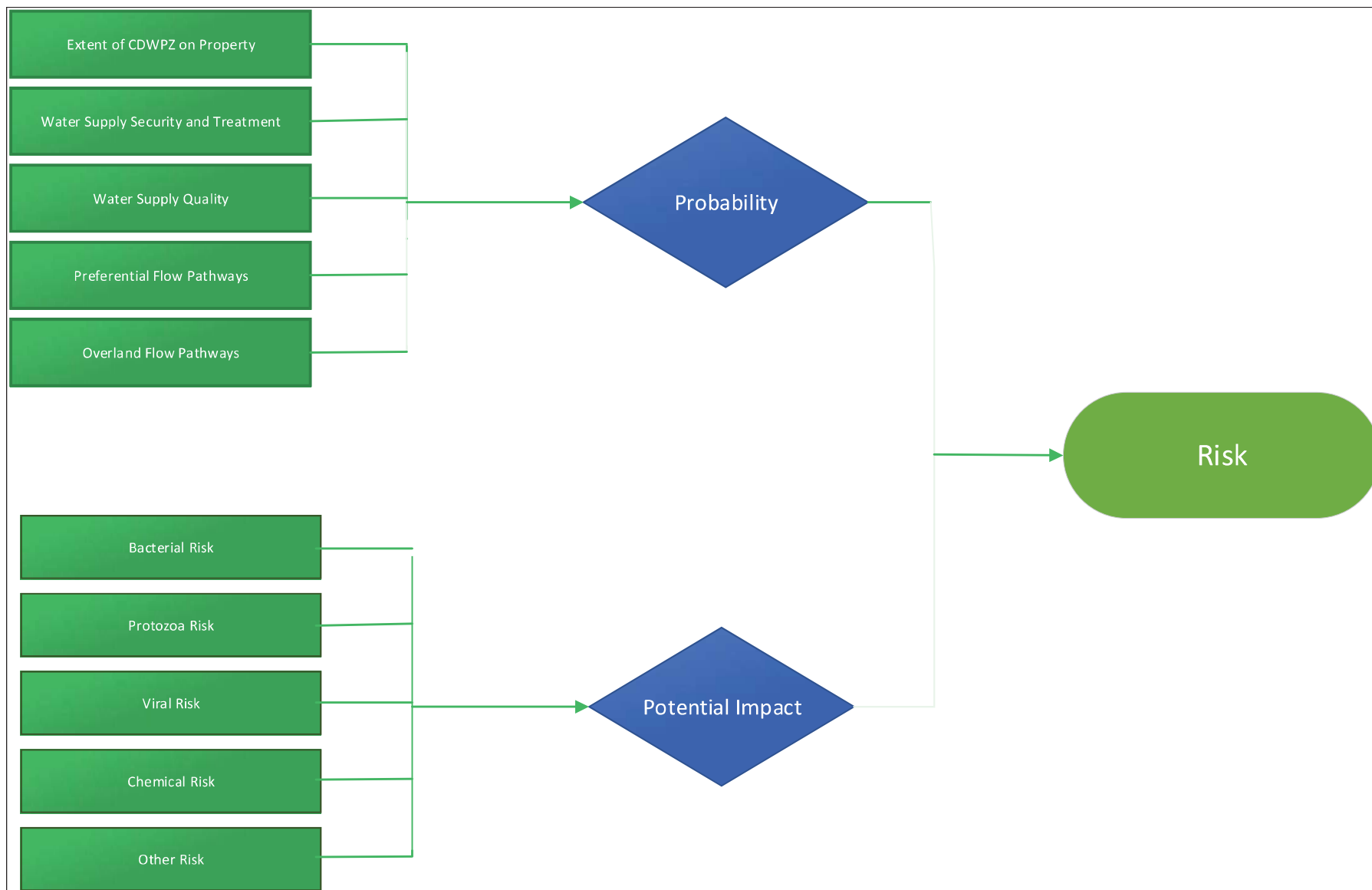
Part B – Management Plan Default Content

The Management Plan shall contain as a minimum:

1. Property details
 - (a) Physical address
 - (b) Description of the ownership and name of a contact person
 - (c) Legal description of the land and farm identifier.
2. A map(s) or aerial photograph at a scale that clearly shows:
 - (a) The boundaries of the property.
 - (b) The boundaries of the main land management units on the property.
 - (c) The location of permanent or intermittent rivers, streams, lakes, drains, ponds or wetlands.
 - (d) The location of riparian vegetation and fences adjacent to water bodies.
 - (e) The location on all waterways where stock access or crossing occurs.
 - (f) The location of any areas within or adjoining the property that are identified in a District Plan as “significant indigenous biodiversity”.
 - (g) The location of any critical source areas for phosphorus loss including any part of the property within the High Runoff Risk Phosphorus Zone.
3. A description of:
 - (a) the on-farm actions that have been undertaken in the previous 01 July to 30 June period to implement the applicable practices described in the table below; and
 - (b) the on-farm actions that will be undertaken over the next 01 July to 30 June period to implement the applicable practices described below.
4. A copy of the Farm Environment Plan or Management Plan shall be retained by the landowner and updated at least once every 12 months as necessary, and provided to the Canterbury Regional Council on request.

Practice	On-farm actions undertaken in the previous 12 months	On-farm actions to be undertaken in the next 12 months
Water, effluent and fertiliser is applied at a rate that does not exceed the water holding capacity of the soil or the agronomic requirements of the crop.		
Irrigation systems, effluent application systems, fertigation systems and fertiliser or organic manure systems are assessed annually, and maintained and operated to apply irrigation water, waste or nutrients efficiently.		
Silage pits, refuse pits and offal pits are sited, designed and managed to avoid the discharge of leachate into surface waterbodies		
Effluent systems meet industry Codes of Practice or an equivalent standard.		
Fertiliser is stored a minimum of 20 metres from surface waterbodies		
Non irrigation water use is monitored and efficient.		
Stock are excluded from waterbodies in accordance with regional council rules or any granted resource consent.		
Vegetated buffer strips of at least 5 metres in width are maintained between areas of winter grazing and any river, lake, drain or wetland.		
Vegetated riparian margins of sufficient width are maintained to minimise nutrient, sediment and microbial pathogen losses to waterbodies.		

Schedule CRC185469E



Community Drinking Water Protection Zone Risk Assessment		
Property Information		
Shareholder		
FEP #		
Property Location		
Land Use		
New or Existing Activity?		
Area CDWPZ (ha)		
Area CDWPZ in FEP (Ha)		Proportion CDWPZ #DIV/0!
Distance to Water Take (m)		
Site Map		

Water Supply Information			
Water Supply Location			
MOH Code			
Bore/SWAP			
Well Depth (m)			
Well Screen Depth (m)			
Water Supply Owner			
Water Safety Plan Prepared?		Date:	
Population Served (#)			
Population Description			
Supplier Advised?		Date:	
		Who:	
Other Information			

Water Supply Drinking Water Standard Compliance	
Water Security Supply	
Water Supply Security	Date:
<i>Explanation/Image of Well Head Casing Condition</i>	
Treatment	
Water Supply Treated?	
Treatment Description	
<i>Image of Treatment/reference which confirms site is treated</i>	
Drinking Water Quality	
Monitoring Frequency:	
Monitoring Organisation:	
Monitoring Data Source:	
MOH Grading:	

CDWPZ Assessment Template v4

Year	Bacteria	Protozoa	Chemical
2019-20			
2018-19			
2017-18			
2016-17			
2015-16			
2014-15			
2013-14			
2012-13			
2011-12			
Other Information			
Drinking Water Standard New Zealand 2005 (rev 2018) Compliance Status			
NES Human Drinking Water Assessment			
Applicable NES DW Provision			

Land Use Impact Assessment		
Contaminant	Description of On-Farm Source	Potential Impact on Human Health
Bacterial and Viral Risk Land Use Activities		
Protozoa Risk Land Use Activities		
Chemical Risk Land Use Activities		
Other Activities		
Comments on Potential Impact		

Site Probability Assessment	
Preferential Pathway Risk Assessment	
Irrigation Description	<i>Proportion within CDWPZ</i> <i>System type, design capabilities</i> <i>Soil type, water holding capacity</i> <i>Management practices</i>
Irrigation System Risk	
Preferential Flow Risk Assessment	<i>Screen depth greater than 80 m = Low Risk</i> <i>Screen Depth less than 80m, Medium or High Risk depending on:</i> <i>soil type(s), farming activities (cultivation/compaction), factors which impact preferential flow e.g. factors which increase/decrease leaching, features which increase/decrease risk of leakage (e.g. water races, dams, trees/forest)</i>
Preferential Pathway Risk	
Overland Flow Risk Assessment	
<i>Describe activities which increase/decrease risk e.g.</i> <i>flood risk</i> <i>soils run-off risk</i> <i>location of natural/artificial waterways</i> <i>S-maps run off potential</i> <i>Distance to water supply take</i> <i>Physical impediments between activity and water supply</i>	

CDWPZ Assessment Template v4

Site Image	<i>include image of site in relation to CDWPZ if possible, including identification of key risk factors and features</i>	
Overland Flow Risk		
Other Factors Summary		
Proportion FEP within CDWPZ	#DIV/0!	
Population Served by Supply	0	
Water Supply Security Status	0	
Water Treatment	0	
Water Quality	0	
Overall Probability	#DIV/0!	
Comments on Probability		

OVERALL RISK SUMMARY					
Risk Factors					
Mitigating Factors					
Risk	Description	Potential Impact	Probability	Risk Level	Mitigation
Bacterial and Viral Risk Land Use Activities	0	0	#DIV/0!		
Protozoa Risk Land Use Activities	0	0	#DIV/0!		
Chemical Risk Land Use Activities	0	0	#DIV/0!		
Other Activites	0	0	#DIV/0!		
Overall Comments					
Assessment Completed By:					
Status:					
Date:					
Assessment Peer Reviewed By:					
Date:					