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BARRHILL CHERTSEY IRRIGATION LIMITED – ANNUAL REPORT

CRC162882 ANNUAL REPORT NOVEMBER 2017

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Contents

1. INTRODUCTION

Barrhill Chertsey Irrigation Limited (BCI) hold resource consent CRC162882 to permit shareholders from BCI and Acton Farmers Irrigation Co-Operative (AFIC) to collectively discharge up to 2,981 tonnes N/year to groundwater from 40,000 ha of farming activities within the Ashburton District.

Currently BCI is consented to take up to 17 m^3/s of water from the Rakaia River, of which up to 3 m^3/s is provided to AFIC, east of Rakaia. Only 9.6 m^3/s of water is allocated to BCI shareholders, with further development of the scheme planned in the future.

All existing shareholders from both schemes were required to complete individual Farm Environment Plans (FEP) by 10 September 2015 and be audited within 24 months. New shareholders need to complete an FEP prior to using water and are audited within 12 months of using water.

An annual report is due 30 November each year to provide a summary of the ASM programme.

The following is a summary of compliance of consent conditions for shareholders from both BCI and AFIC irrigating in the 2016-17 season and includes:

- V6.2.3 OVERSEER updated Nitrogen Discharge Allowance
- 2017 Scheme Management Plan Review Report

2. CONDITIONS SUMMARY

CONDITION 1

This consent authorises:

a. *the use of land for farming; and*
b. *the discharge of nutrients to water arising from the use of farming authorised in clause a.*

No comment required.

CONDITION 2

The use of land and discharge specified in condition 1. shall only occur within a maximum of 40,000 hectares on:

a. *the areas marked as Areas 1-8 on attached plan CRC141388, which forms part of this consent; and*
b. *any land located between the Rakaia and Rangitata Rivers covered by a separate consent to use water that has been taken under CRC132861 or any subsequent variation thereof.*

BCI water is irrigated onto 212 properties through BCI and AFIC irrigation schemes between the Rakaia and Rangitata Rivers (blue properties seen in Figure 1). Approximately 52% of properties irrigated with BCI water also received water from another source. The “Primary Water Sources” map (Figure 2) shows the main water source for BCI and AFIC shareholders. In many cases, BCI and AFIC water is used to support groundwater takes, which are the primary source of water on the property.

The “BCI Irrigated Area” was calculated using two methods:

1. Where BCI water was used to irrigate a particular area; the actual area irrigated by BCI was used.
2. Where BCI water was mixed with other sources of water; the BCI irrigated area was calculated using the relative proportion of water by flow rate. E.g. if 50 l/s comes from BCI and 25 l/s from groundwater, then 2/3rd of the total irrigated area is attributed to BCI.

The total estimated area irrigated using BCI water during the 2016-17 irrigation season was 26,498 ha.

It is anticipated a further 214 ha will start to be irrigated by BCI in the 2017-18 season, bringing the total estimated area of the scheme to 26,712 ha in the coming season. A summary of areas managed under the BCI ASM programme is listed in Table 1.

TABLE 1: SUMMARY OF AREAS MANAGED UNDER CONSENT

	2014-2015 Measured Area	2015-2016 Measured Area	2016-2017 Measured Area	Estimated Area*
Total FEP Managed Area (ha)	40,173	53,699	57,912	26,498
Total Irrigated Area (ha)	29,238	44,655	48,974	26,498
Total Effective Dryland (ha)		7,107	6,919	
BCI Scheme Irrigated Area (ha)	12,704	18,586	19,017	20,342
AFIC Scheme Irrigated Area (ha)	5,274	4,820	4,507	6,156
Total BCI Irrigated Area (ha)	**17,978**	**23,406**	**23,524**	**26,498**

*From consent application

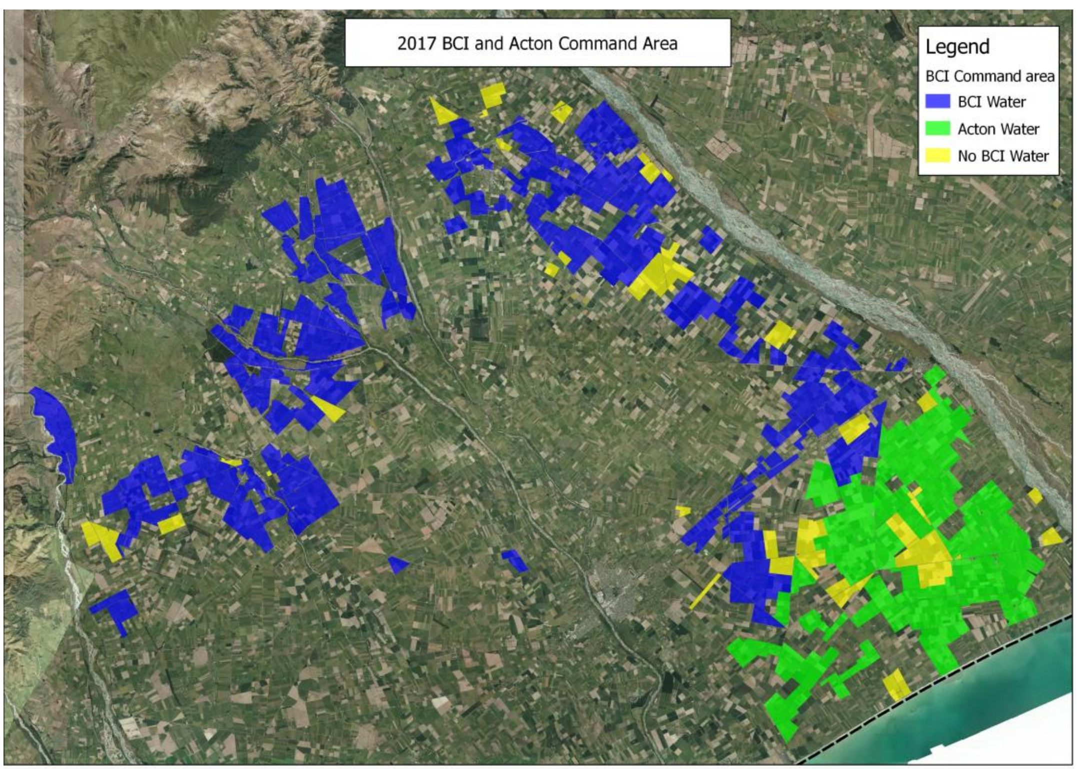

FIGURE 1: BCI AND ACTON IRRIGATED PROPERTIES

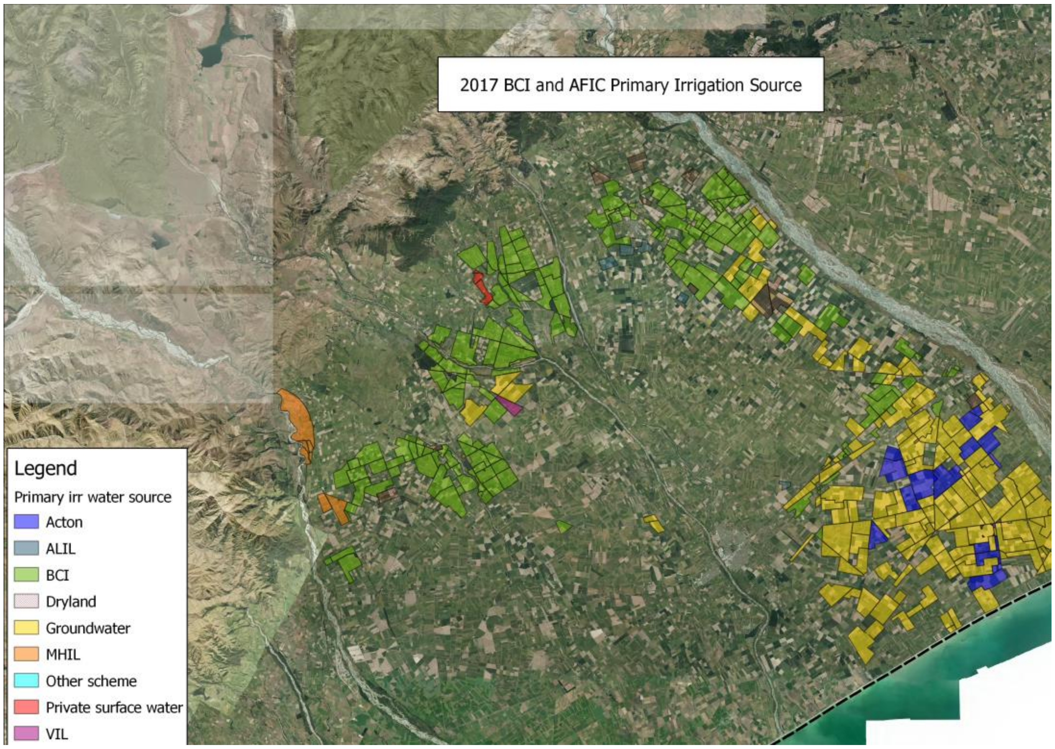

FIGURE 2: BCI AND AFIC PRIMARY IRRIGATION SOURCE 2016

CONDITION 3

A Farm Environment Plan (FEP) shall be prepared:

a. *by 10 September 2015 for any properties that had existing water supply agreements with the consent holder that were in place prior to July 2013; and*
b. *for any properties with agreements subsequent to those specified in clause a., prior to the delivery of water to that property.*

The FEP shall be prepared in accordance with Schedule One, which forms part of this consent. The FEP shall be updated as necessary and on farm practice shall be in accordance with the FEP.

All BCI and AFIC shareholder FEPs were completed in the winter of 2015 using the approved Rangitata Diversion Race (RDR) Rubicon online template.

The Irrigo Centre Limited applied for, and was granted, Schedule 7 approval of their own version of the Farm Environment Plan. This plan incorporated the Objectives and Targets of the proposed Schedule 7 of the Plan Change 5 version of the Land and Water Regional Plan. Other key changes included more detail to trend intensification by shareholders and a greater emphasis of the Good Management Practices described in the *Industry Agreed Good Management Practice Relating to Water Quality* booklet issued in September 2015.

All shareholders were required to update their FEP to the Irrigo Template by 30 August 2016, which was then reviewed and updated over the winter of 2017.

In total, 181 FEPs have been prepared between both BCI and AFIC schemes, covering a total of 249 properties over 58,812 ha.

Approximately 37 properties within our FEP/ASM programme are not irrigated by either BCI or AFIC, but form part of a farming enterprise, owned by a shareholder. We will be supporting these shareholders with meeting their zone nutrient management requirements.

2017-18 Season Shareholders

A total of 2 new shareholdings have been purchased and are due to start irrigating with BCI in the 2017-18 season. One of these have included new properties incorporated into existing FEPs, while the other had an FEP completed over the winter.

Exempt Shareholdings

We request the following non-farming activities are exempt from the nutrient management and FEP requirements of this consent:

- Methven Rugby Club
- SPS Seeds
- Methven Trotting Club
- AG Wright

All four shareholders use less than 5 l/s of water. Methven Rugby Club uses BCI water to irrigate the Methven Rugby Club sports field. SPS seeds use the water to irrigate seed trial plots, over an area of less than 1 ha. Methven Trotting Club use BCI water to dampen the horse racing track, while AG Wright uses 1 l/s to irrigate Oak trees to inoculate with truffle fungi

Due to the nature of these activities, it is not feasible to prepare FEPs or nutrient budgets for these properties.

Dry Shareholders

BCI and AFIC have two shareholders where they own shares, but are not currently irrigated by either scheme. All of these properties have chosen to join our nutrient management programme and have completed their FEPs and nutrient budgeting requirements.

Note for FEP Managed Area

Many shareholders use multiple sources of water on their property through a single irrigation system and therefore it was impractical to exclude these areas from the Farm Environment Plan. Shareholders were also encouraged to assess their enterprise as a whole and permitted to include properties not irrigated by BCI within their FEP. For these reasons, the FEP areas managed and audited far exceed initial estimations.

CONDITION 4

Audited Self Management Programme

a. *Prior to 1 July 2016, the consent holder shall implement and adhere to an audited self-management programme (ASM), which is developed by a suitably qualified person and approved by the Canterbury Regional Council. The ASM document shall include, but is not limited to:*
    i. *Environmental Targets and Objectives for the scheme and its shareholders;*
    ii. *The proposed monitoring and reporting regime including but not limited to a description of the:*
        a. *Farm Environment Plan (FEP) audit process and the frequency used to assess individual on-farm progress with the content of any FEP and Schedule One;*
        b. *Methods used to follow up with shareholders who are not achieving the environmental objectives of Schedule One as identified during individual farm audits;*

c. The proposed data to be collected and reported to the Canterbury Regional Council;
d. Independent annual review of the FEP audit process;
e. How nutrients from all land subject to the scheme or principal water supplier will be accounted for;

b. Any significant changes to the ASM document shall be implemented only after approval confirmed in writing by the Monitoring and Compliance Manager, Canterbury Regional Council.
c. FEP Audits shall be undertaken by a suitably qualified person at a frequency determined in accordance with Schedule Two, with the exception of the first audit, which shall be completed in accordance with the conditions 4(c)(i) and 4(c)(ii);
   i. 50% of all FEPs prepared prior to 10 September 2015 shall be audited by 10 September 2016
   ii. 50% of all FEPs prepared prior to 10 September 2015 shall be audited by 10 September 2017
   iii. All FEPs prepared after 10 September 2015 shall be audited within 12 months of being completed.
d. 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:
   i. The name of the FEP auditor(s);
   ii. A summary of the audit performance grading;
   iii. A summary of the reasons for any farm receiving a C or D grade;
   iv. A summary of farms that have repeatedly received a C or D grade;
   v. The progress achieved for previously identified issues, if applicable;
   vi. The total annual loss of nitrogen from all properties within the Irrigation Scheme or Principal Water Supplier over the reported year.
   vii. The performance of the scheme in meeting its environmental targets and objectives.
e. A copy of the annual report shall be provided to the Monitoring and Compliance Manager, Canterbury Regional Council, by 30 November each year;
f. The FEP Audit records for each property undertaken in accordance with condition (4) shall be kept and made available for the Canterbury Regional Council to inspect, upon request.
g. The consent holder shall notify the Monitoring and Compliance Manager, Canterbury Regional Council within 20 working days of any exclusion of a shareholder (s) from the ASM programme.

Part (a) – Audited Self Management Programme

The BCI Audited Self Management (ASM) Programme was reviewed by Irricon Resource Solutions in October 2017. The review assessed:

- Scheme Management Plan (SMP) meets requirements of this consent, CRC162882
- Where improvements can be made to the SMP, particularly against ISO14000 system standards
- Whether the processes detailed in our SMP were being followed
- Whether audited nutrient budgets provided to determine compliance with the scheme load were robust and prepared to the Best Practice Inputs Standards
- Whether audited FEP Audit reports to ensure Canterbury Certified Farm Environment Plan (FEP) Auditor Manual (February 2016) processes were followed.

The full report is attached as Appendix 1: BCI IRRIGATION SCHEME EMS REVIEW 2017.

The overall summary of the ASM programme review states:

"The overall impression of the reviewers is that the Scheme Management Plan is well organised and record keeping is excellent. The actions from the 2016 audit have been given careful consideration and the majority have already been implemented. Two outstanding actions have been included as corrective actions for this audit. There is generally a good approach to the environmental management system with flexibility to adapt and adjust processes to meet requirements. The review has identified some key aspects of an environmental management system which should be included in the SMP, however the SMP was found to meet the requirements of an Audited Self-Management Plan under resource consent number CRC162882".

Part (b) – SMP Updates

The BCI Scheme Management Plan (SMP) has been scheduled to be reviewed in February 2018 to include the following information:

- Recommendations arising from the Irricon BCI EMS review
- Incorporate recommendations from shareholders and the BCI and AFIC boards
- Review all policies and procedures to ensure:
    a) They remain relevant and up to date
    b) They cover all essential processes

We will ensure the updated SMP is submitted to Environment Canterbury for approval prior to implementing any significant changes.

Part (c) – 2016-17 Season FEP Audits

Farm Environment Plans (FEPs) started to be audited in the 2015-16 irrigation season. Prior to 10 September 2015, BCI and AFIC had 136 shareholders, of which there were 126 Farm Environment Plans completed. Of these shareholdings, 63 needed to be audited prior to 10 September 2016 and the remaining 63 existing shareholdings needed to be audited prior to 10 September 2017. All FEP Audits for all new and existing shareholders have now been completed.

There are currently 2 dry shareholdings of BCI and AFIC who own shares, but are not currently irrigated by the scheme. Of these one completed their FEP in the winter of 2016, and was audited this past season. The other completed their FEP in the winter of 2017 and will be audited this coming season.

Part (d) – 2016-17 Season FEP Audit Summary

A summary of who completed FEP Audits and how many in the 2016-17 season is in Table 2.

All FEP Auditors have completed the Advance Sustainable Nutrient Management Course from Massey University and had been registered as accredited FEP Auditors by Environment Canterbury.

TABLE 2: SUMMARY OF AUDITORS 2016-17 SEASON

	Organisation	Accredited FEP Auditor? Y/N	Number of Audits Completed
Megan Hands	Irrigo Centre Limited	Y	77
Ali Van Polanen	EnviroPlan	Y	6
Glen Treweek	Aqualinc/Ground Sense Limited	Y	9
Jane Mitchell	Independent Consultant	Y	2
Dave Lucock	AgriBusiness Group	Y	2
Total			96

Of the 96 audits completed in the 2016-17 irrigation season, 75 audits were the first audit for the property and the remaining 21 were re-audits. Re-audits were completed for those who received a “C” or “D” grade in the 2015-16 season, changes in ownership, management or land use.

A summary of the FEP Audit grades for the initial audit is in Table 3.

TABLE 3: SUMMARY OF FEP AUDIT GRADES

	BCI			AFIC			Total		
	15-16	16-17	Total	15-16	16-17	Total	15-16	16-17	Total
A	9	10	19	5	3	8	14	13	27
%	11	13	12	21	10	15	13	14	13
B	67	55	121	15	21	36	82	76	158
%	80	81	81	63	72	68	78	78	77
C	7	1	9	4	5	9	11	6	17
%	8	3	6	17	17	17	10	7	9
D	1	1	2	0	0	0	1	1	2
%	1	1	1	0	0	0	1	1	1
Total	84	67	151	24	29	53	108	96	204

Overall, we found the majority (~80%) of audited properties achieved a “B” grade. The “B” grade simply meant something needed to be done to achieve Good Management Practice and there was a plan in place to improve. There was a considerable variation within “B” graded properties as to how much was required to achieve GMP, with some requiring quite a bit of work and considerable on-going support, whereas will require very little.

We are anticipating a wider spread of FEP audit grades in the 2017-18 season as a number of shareholders have undertaken the actions recommended in their first audits, and so should be able to achieve an “A”. There are also potentially some shareholders who have taken no actions at all, and these will likely achieve a “C” grade in their second audit, even if there is no decline in their farm environmental management practices.

Reasons for “C” or “D” grades

A total of 6 “C” audit grades and 1 “D” grade was issued in the 2016-17 season. The “D” grade was issued to a dairy farm, and the “C” grades were issued to a mixture of arable, dairy and dairy support properties. Every property receiving a “C” or “D” grade has had a follow up visit and included the audit recommendations into their 2017 FEP Update. The list of reasons for “C” or “D” grades is given in Table 4.

The single “D” grade was due to on-going issues with effluent management, with minimal effluent storage available. The “D” audit grade was formally challenged by the shareholder, and the audit was peer-reviewed by Ali Van Polanen. The grade was deemed issued to be in accordance with the FEP Auditors manual grading requirements. This property received a cease water notice in August 2017 in accordance with our SMP after the grade was reviewed, as this was the second “D” grade issued to that property. We are continuing to work closely with the shareholder to support them with improving their environmental performance.

TABLE 4: SUMMARY OF REASONS FOR "C" OR "D" GRADES 2016-17 SEASON

Reason for C or D grade	# Grades	Follow Up Action
Lack of Training	2	One on one follow up, personally advise of applicable training days
Inadequate infrastructure	1	Create a plan to upgrade in the medium term and improve back-up plans until upgrades can occur
Unable to demonstrate efficient irrigation scheduling	3	Provide one on one assistance with collection of data
Unable to demonstrate efficient nutrient management	3	Provide one on one assistance with collection of data
Late cancellation of audit	1	Next audit scheduled 28 November 2017
No records provided	1	Provide one on one assistance with collection of data
Inadequate progress of FEP Actions since previous audit	1	Provide on-going assistance to resolve issues identified
Potential non-compliance with effluent resource consent observed	2	Request issue rectified immediately.
Effluent solids stored inappropriately	1	Request issue rectified immediately.

Generally, the environmental effect of "C" grade farms was not significantly different from most "B" grade farms. However, it was observed there were often other issues going on which would hinder the engagement and uptake of Good Management Practices on-farm over time. For instance, 50% of the properties which received a "C" grade in the 2015-16 season have since been sold or put onto the market.

Two "C" grades related to properties which had received "C" grades in the 2015-16 season, however in both cases, these properties were under new ownership or there had been significant management changes.

Overall, 9 out of 11 properties graded "C" in the 2015-16 season were re-audited as "B" grades in the 2016-17 season. The results of the follow up for all properties graded "C" or "D" in the 2015-16 season is listed in *Scheme Performance with Objectives and Targets*
Grades given for each objective and target assessed in the FEP Audits were collated and are summarised in Figure 4 and Figure 4. The only Low Level of Confidence (LOC) grade given against an objective was related to effluent on the "D" graded property. Most Low LOC grades for targets were given for irrigation and effluent management.

Overall, the largest proportion of Medium LOC grades were issued in irrigation management targets, with most shareholders doing well in fertiliser and soils management. Properties audited in the 2016-17 season had higher proportions of "High" target grades for irrigation and effluent management and staff training, with fewer "Low" LOCs in these areas compared to the 2015-16 season audits.

Approximately 80% of shareholder properties have open stockwater races, however only 30% are located near natural waterways. Of these, the natural waterbody is generally adjacent to, but outside the property for all but two properties in the scheme. For this reason, the vast majority of properties were not assessed against Waterbody Targets 2 and 3.

Table 5.

Scheme Performance with Objectives and Targets

Grades given for each objective and target assessed in the FEP Audits were collated and are summarised in Figure 4 and Figure 4. The only Low Level of Confidence (LOC) grade given against an objective was related to effluent on the "D" graded property. Most Low LOC grades for targets were given for irrigation and effluent management.

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TABLE 5: RESULTS FROM 2015-16 SEASON "C" OR "D" GRADE PROPERTIES

2015-16 Season “C” or “D” grade property	Follow Up Action Taken	Result
2340	Provided on-going one on one support	Re-audited, “B” grade
8013	Provided on-going one on one support	Re-audited, “B” grade
8018	Property sold	New owner audited
8038	Identified key farm advisor to provide on-going one on one support	Re-audited, “B” grade. Property currently on the market
8039	Provided on-going one on one support. Two of four properties sold, one leased, only 15 ha block remained under original owner’s management, which was destocked.	FEP split, new owner re-audited, “B” grade”. Old owner re-audited, “C” grade
9016	Provided on-going one on one support. New sharemilker employed.	Re-audited, “B” grade
9021	Provided on-going one on one support	Re-audited, “B” grade. Property currently on the market.
9047	Provided on-going one on one support	Re-audited, “B” grade
9057	Property sold	New owner audited
9064	Provided on-going one on one support	Re-audited, “B” grade
9068	Provided on-going one on one support	Re-audited, “D” grade, Orange Card Issued to cease water
9072	Provided on-going one on one support	Re-audited, “B” grade, property since sold

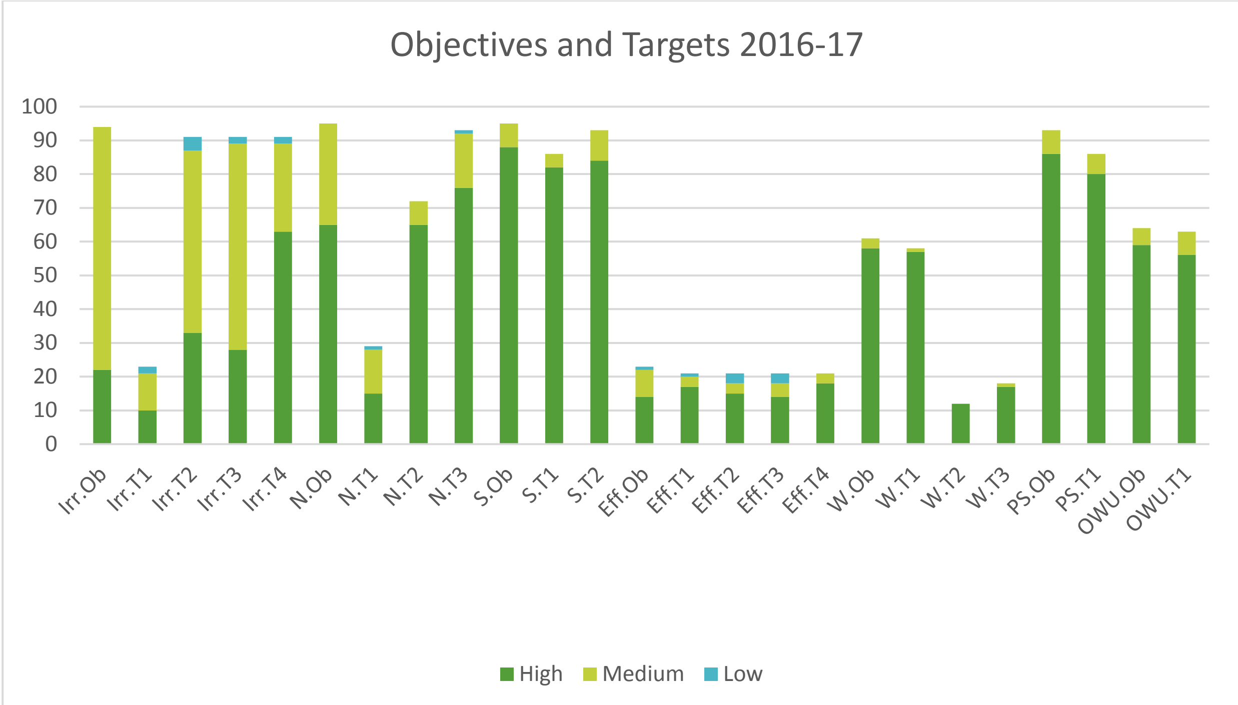

FIGURE 3: SUMMARY OF AUDIT GRADES FOR OBJECTIVES AND TARGETS 2016-17

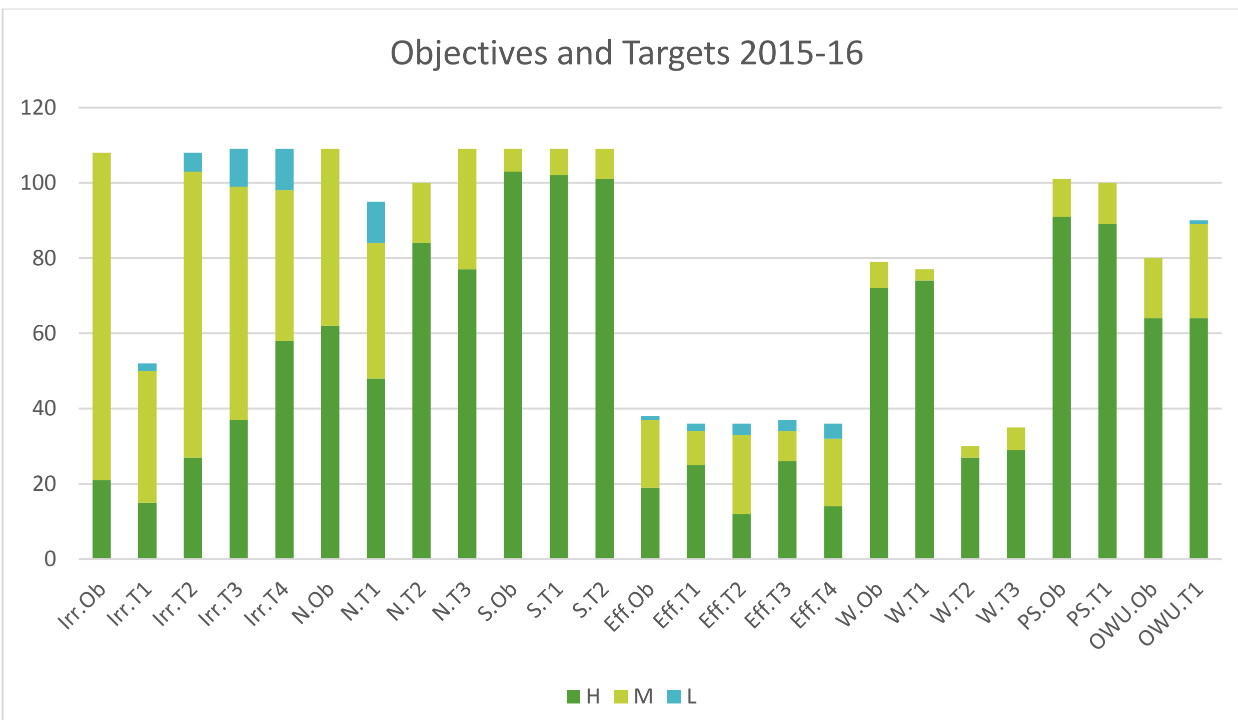

FIGURE 4: SUMMARY OF AUDIT GRADES FOR OBJECTIVES AND TARGETS 2015-16

The Other Water Use Objective is not currently included in the Farm Environment Plan Schedule One and is currently under review as part of the Plan Change 5 submission process, therefore does not affect the overall grade of the audit at this point in time. However, we are advising shareholders of these requirements, particularly of the need to meter water usage in dairy sheds by 2020 under the Sustainable Dairy Water Accord.

Parts (e), (f) and (g) – Other Requirements

This report meets the reporting requirements of resource consent CRC162882.

All FEP Audit records are kept on file, as assessed as part of the Irricon EMS review.

No shareholder has been excluded from the Scheme in the 2016-17 season.

CONDITION 5

The combined average annual amount of nitrogen lost to water as calculated from the individual Farm Environment Plans prepared in accordance with condition 3. shall not exceed a total of 1,232 tonnes if Overseer version 6.0.3 is used or X tonnes if a subsequent Overseer version, or equivalent model approved in writing by the Canterbury Regional Council RMA Compliance and Enforcement Manager is used. For the purposes of this condition, X equals the total average annual nitrogen loss calculated using the current version of Overseer, or equivalent model approved in writing by the Canterbury Regional Council RMA Compliance and Enforcement Manager, based on the following:

a. 17,604 hectares of land with irrigation supply agreements in place with the consent holder prior to July 2013; and
b. 22,396 hectares of subsequent irrigation areas;

Provided that the land uses and management practices modelled must be consistent with the activities described in the application.

Updated N load Limited with OVERSEER 6.2.3

The OVERSEER model was updated to v6.2.3 in November 2016 and did not include any significant changes, compared to previous years.

PDP were employed in August 2017 to update the background files and recalculate the nitrogen discharge allowance (NDA) using OVERSEER v6.2.3. A copy of the PDP report is included as Revised N Load Calculation – v6.2.3 OVERSEER

The recalculated NDA was **2,934 tonnes N/year**, assuming 1,615 tonnes N/year from existing shareholders and 1,319 tonnes N/year for new shareholders. The N loading limit assumed a total of 40,000 ha irrigated by BCI.

Land use estimates were relatively consistent with the original NDA calculation, though with a higher proportion of arable properties signing onto Stage 2 than anticipated.

Primary and Secondary Land use is summarised in Figure 5, Figure 6 and Table 6. Approximately 74% of BCI and AFIC shareholders have more than one use of land, with 37% having three or more uses.

The majority of shareholders who started irrigating within BCI in 2015-16 and 2016-17 season were arable or beef grazing. New shareholders in the 2016-17 season are also primarily arable.

TABLE 6: PRIMARY LAND USE DISTRIBUTION BY FEP

	2015 Primary Land Use	2016 Primary Land Use	2017 Primary Land Use	Estimated Land Use*
Arable	54%	52%	51%	38%
Dairy	29%	20%	26%	40%
Dairy Support	16%	20%	6%	18%
Sheep & Beef, Mixed, Other	1%	8%	7%	4%

*From consent application

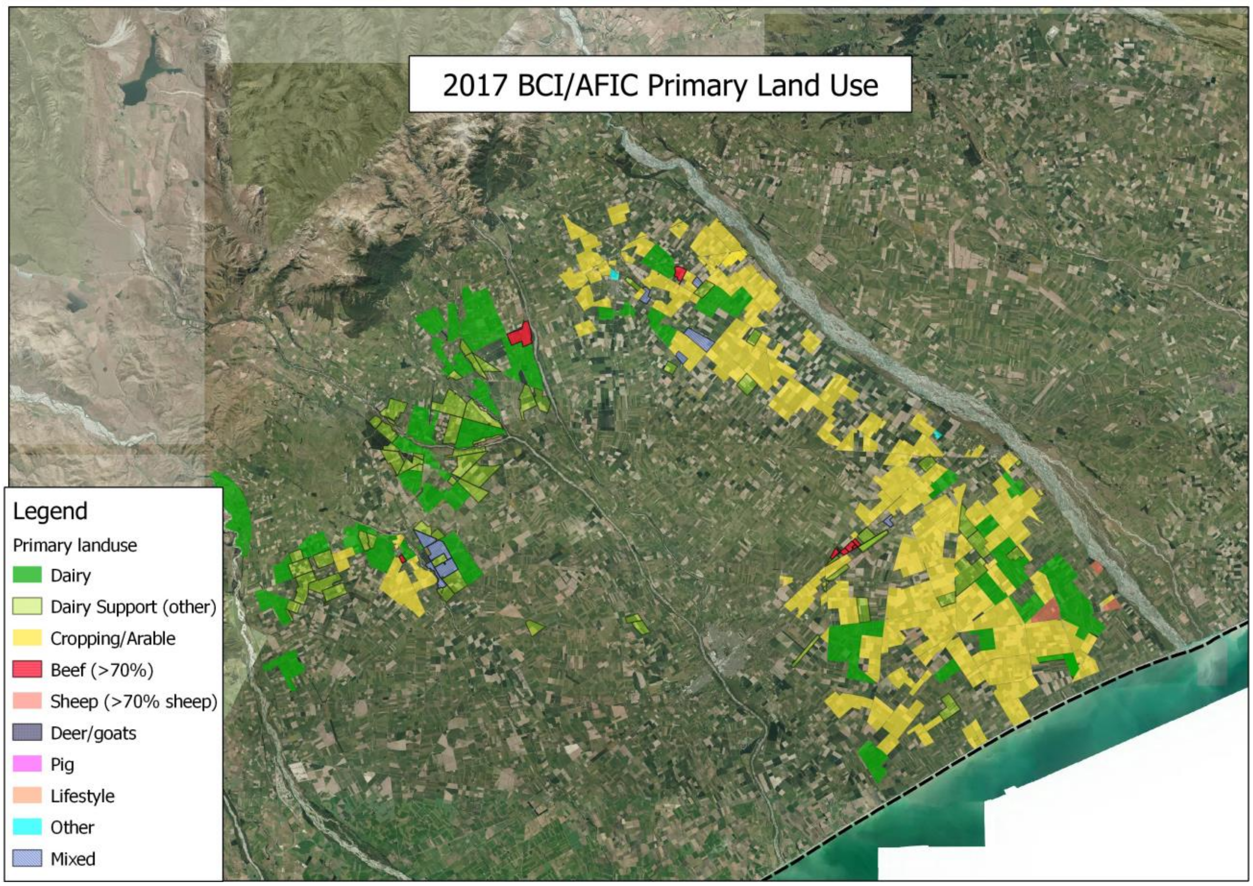

FIGURE 5: 2016-17 PRIMARY LAND USE FOR BCI AND AFIC SHAREHOLDERS

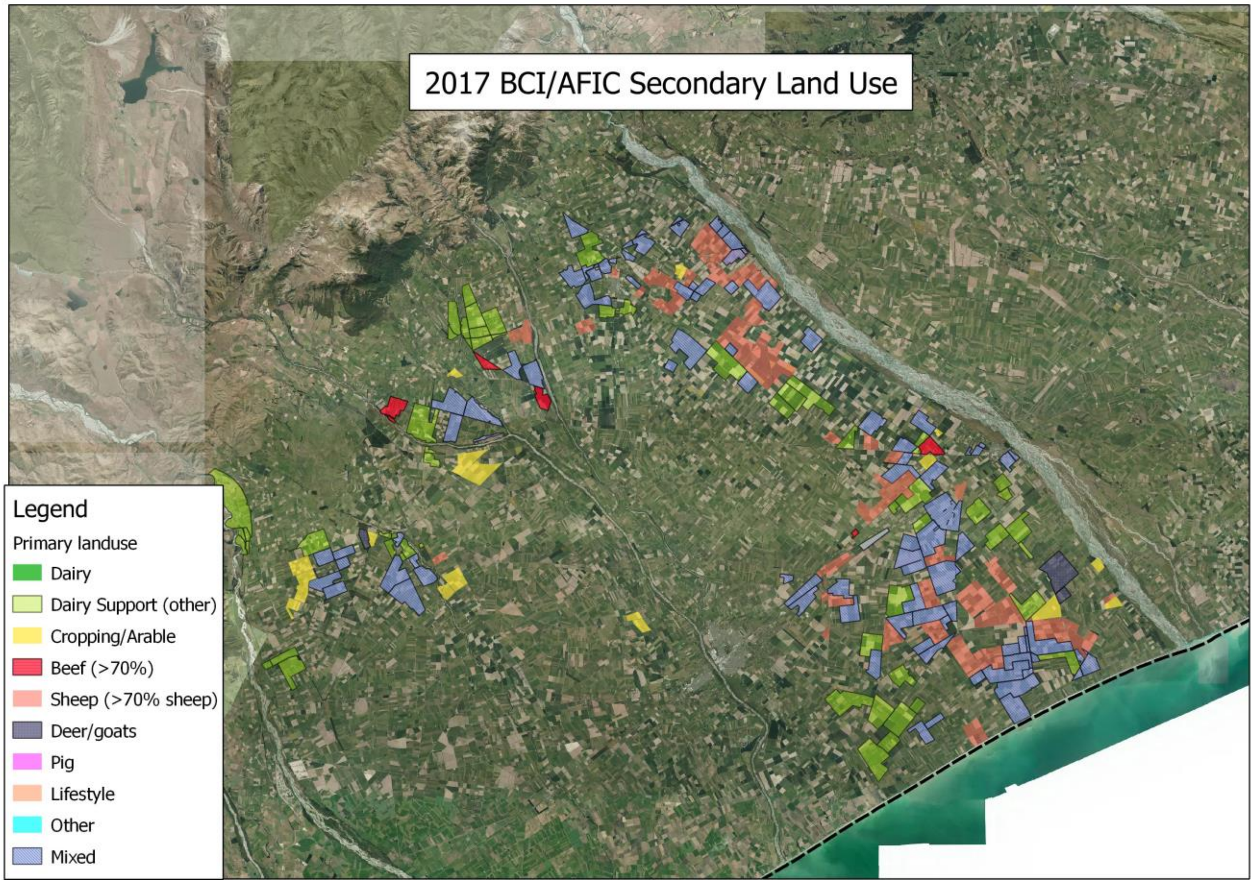

FIGURE 6: BCI AND AFIC SECONDARY LAND USE 2016-17

2016-17 Season N loss

To facilitate the preparation of nutrient budgets, BCI signed Memorandum of Understandings (MOUs) with both Ballance Agri-Nutrients and Ravensdown Environmental Teams. We provided their consultants with the maps and areas of each property, which was recorded through their FEP the previous season.

We also developed nutrient budget consistency standards, which were agreed to by all major companies preparing nutrient budgets for shareholder properties. These standards set out the procedure for modelling irrigation and workarounds to ensure consistency between parties.

All nutrient budgets were prepared by or reviewed by suitably qualified professional in accordance with the Best Practice Data Input Standards (November 2016) (BPDIS) where possible, or an explanation provided as to why deviation was necessary.

All shareholders irrigated by either BCI or AFIC in the 2016-17 season completed an OVERSEER nutrient budget, using data collected in the 2016-17 season and the above methodology. All nutrient budgets were completed using v6.2.3 OVERSEER.

It is noted v6.2.3 of OVERSEER corrected a N uptake error in the crop model, which will generally increase N losses in arable properties.

All nutrient budgets were prepared for the whole property. As mentioned in condition 2, many properties irrigated by BCI were also irrigated by other sources of water. The total N loss used to calculate the BCI NDA load was proportional to the amount of water the scheme provided for the property. E.g. if BCI supplies 50% of water to the property, then 50% of the N load was added to the NDA. If BCI was the only source of water for the property, the nutrient loss for the whole property (including the effective dryland) was included in the scheme load. Where there were multiple sources of water, the N loss from the effective dryland was proportioned according to the relative amount of water provided from each source. The details of how these calculations are made were included in the SMP.

A calculated N loss figure could be prepared for every shareholder this season, however many required a "workaround" to overcome errors within the model and so do not necessarily reflect the activities on the property the previous season. Some examples of common workarounds include:

- Replacing stock with "non-farm animals"
- Including a pasture block where there were none
- Adjusting the yield of crops or amount of supplementary feed made/removed to feed stock
- Modelling various seed crops as "Ryegrass seed"

In each case a "workaround" was required, we recorded that one was completed, kept the original input file so there is a record of what actually happened on the property that season, and recorded the type of workaround made.

Table 7 compares 2016-17 season N loss per scheme with the amount of N lost expected by our models.

The calculated N loss for all current shareholders in the 2016-17 season was **1,594 tonnes N/year**, below the 1,961 tonnes N per year expected at this stage of the water release.

TABLE 7: SUMMARY OF 2016-17 N LOSS FOR SCHEME

	2015 Modelled N Loss	2016 Modelled N Loss	2017 Modelled N Loss	Estimated N Loss *
Total FEP Managed N Loss (tonnes N/year)	2,420	2,773	3,034	2,934
BCI Scheme N Loss (tonnes N/year)	944	1,410	1,402	1,648
BCI Average N loss (kg N/ha/year)	55	58	57	71
AFIC Scheme N Loss (tonnes N/year)	297	243	192	313
AFIC Scheme Average N Loss (kg N/ha/year)	54	49	57	61
Total BCI N Loss (tonnes N/year)	1,241	1,653	1,594	1,961
Overall Average N loss (kg N/ha/year)	60	52	55	73

*Updated N loss calculated in Appendix 2 attached.

Based on these results, BCI is currently utilising 72% of their water allocation, however have only used 54% of their nutrient allocation. Scheme nutrient losses have therefore reduced relative to BCI's NDA limit since we first started measuring this information, despite more irrigation shares being issued – see Figure 7.

Reasons for the relative reductions in nutrients are likely due to the following factors:

- Improved and more accurate record keeping by shareholders
- Increased use of irrigation scheduling tools, such as soil moisture monitoring tapes or probes.
- Improved consistency of preparation of nutrient budgets.

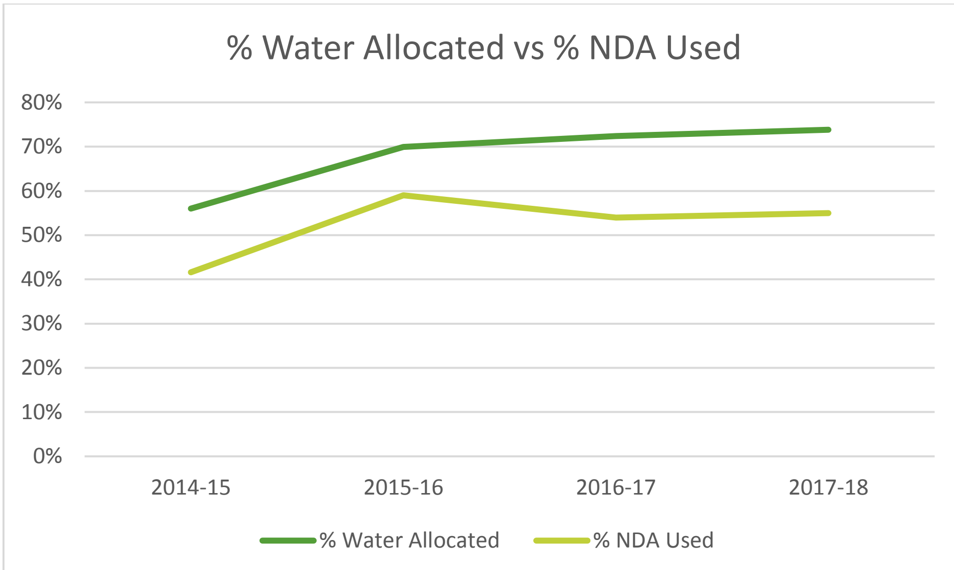

FIGURE 7: BCI PERCENTAGE OF WATER ISSUED COMPARED TO SCHEME NUTRIENT LOSSES 2014-2018

CONDITION 6

The consent holder shall ensure that each farm that it supplies water to shall maintain detailed records of fertiliser application rates, location and crop type (including winter feed/forage crops), cultivation methods, stock units by reference to type and breed, and all other inputs to the Overseer nutrient budgeting model. The records shall be made available to the Canterbury Regional Council on request.

All shareholders are aware of the requirements to improve records used to provide an OVERSEER nutrient budget annually.

CONDITION 7

The Canterbury Regional Council may, once per year, on any of the last five working days of May or November, serve notice of its intention to review the conditions of this consent for the purposes of dealing with any adverse effect on the environment which may arise from the exercise of the consent and which it is appropriate to deal with at a later stage.

No comment required.

APPENDIX 1: BCI IRRIGATION SCHEME EMS REVIEW 2017

APPENDIX 2: REVISED N LOAD CALCULATION – V6.2.3 OVERSEER