Otago Regional Council

Section 42A Staff Recommending Report

Water Permit Applications RM20.007.01 and RM20.007.02

Smallburn Limited.

The recommendation in the staff report represents the opinion of the writers and it is not binding on the Hearing Commissioners. The report is evidence and will be considered along with any other evidence that the Hearing Commissioners will hear.

Kirstyn Lindsay
Consultant Planner

18 August 2020

Executive Summary

Smallburn Limited have applied for water permits RM20.007.01 and RM20.007.02 to replace a deemed permit to take and use water and to retake and use water from the Amisfield Burn and Park Burn catchments.

I believe that the key issues with this application are:

- Consent duration;
- Rate and volume of take; and
- The need for a residual flow

After assessing the actual and potential effects of the applications, considering submissions, and considering all of the matters in section 104 of the Resource Management Act 1991, I recommend that this application be **granted** for a period of **15 years**, subject to the conditions listed at the end of this report.

Report Author

Please note that this report contains the recommendations of the Reporting Planner and represents the opinion of the writer. It is not a decision on the application.

Kirstyn Lindsay – Consultant Planner, Southern Planning Solutions Limited

I am the sole director and independent consultant planner of Southern Planning Solutions Limited. I hold a Masters in Planning with Distinction from the University of Otago. I have over 17 years' professional experience in district and regional planning. I am an accredited RMA Commissioner with Chairs Endorsement and hold full NZPI membership.

I have been engaged by the Otago Regional Council to report and make a recommendation on the above application. I have read the Code of Conduct for Expert Witnesses in the Environment Court Practice Note 2014. While this report has not been prepared for the Environment Court, it has been prepared in accordance with the practice note. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

I have been involved with the subject application since it was lodged and received.

OTAGO REGIONAL COUNCIL DEEMED PERMIT REPLACEMENT
SECTION 42A REPORT

ID Ref:	**A1370497**
Application No(s):	**RM20.007.01 and RM20.007.02**
Prepared For:	**Hearings Panel**
Prepared By:	**Kirstyn Lindsay, Consultant Planer**
Date:	**28 July 2020**

Subject: **Section 42A Recommending Report – Limited- Notified Deemed Permit Replacement by Smallburn Limited to take and use surface water from Breakneck Creek, Amisfield Burn, Park Burn and a tributary of Park Burn and to retake and use water from the Park Burn and Five Mile Creek, Pisa Moorings**

1. Purpose

This report has been prepared under Section 42A of the Resource Management Act 1991 (RMA) to assist in the hearing of the application for resource consent made by the applicants. Local authorities may commission a consultant to prepare the Section 42A report and may consider the report at any hearing. The purpose of the report is to assist the Hearing Panel in making a decision on the applications.

The report assesses the application in accordance with Sections 104 and 104C of the Resource Management Act 1991 and makes a recommendation as to whether the application should be granted, and, if granted, a recommendation on the duration of the consent and appropriate conditions.

This report contains the recommendations of the Consultant Planner and is not a decision on the application. The recommendations of the report are not binding on the Hearing Commissioners. The report is evidence and will be considered along with any other evidence that the Hearing Commissioners will hear.

Background Information

Applicant: Smallburn Limited.

Applicant's Agent: Will Nicholson – Landpro Ltd

Site address or location: Lower flanks of the Pisa Range approximately 4.5 kilometres (km) north of Low Burn Valley Road.

Legal description of the point of take: Lot 3 DP 343853 as contained in Record of Title 180117

Legal description of the points of use: Lot 4 DP 481936 as contained in Record of Title 677069

Map references:

- **Breakneck Creek Take:** NZTM 2000 E1301345 N5019169
- **Amisfield Burn Take:** NZTM 2000 E1300945 N5018568
- **Park Burn Combined Take:** NZTM2000 E1300170 N5017299
- **Retake 1 (Park Burn):** NZTM2000 E1301017 N5016576
- **Retake 2 (Five Mile Creek):** NZTM 2000 E1300507 N5015359

Consent(s) sought: Replacement water permits and permits to retake water.

Purpose of take: Irrigation and stock water supply

Deemed permits: 96320.V1, 96321.V1, 94394, RM15.007.01

Notification:

The application was originally approved to be processed on a non-notified basis on 17 March 2020 subject to the applicant obtaining the written approval of the following affected parties:

- Aukaha Limited on behalf of local runanga - Kāti Huirapa Rūnaka ki Puketeraki and Te Rūnanga o Ōtākou;
- Te Ao Marama on behalf of local runanga – Te Runanga o Waihopai
- Te Runanga o Ngai Tahu
- Department of Conservation on behalf of the Director General of Conservation
- Rockburn Wines Limited
- Lowburn Land Holdings Limited
- Mark II Limited

The applicant subsequently requested limited notification to those parties and the application was limited notified to the identified parties on 15 June 2020.

Site visit:

A site visit was undertaken on 7 February 2020 and attended by Kirstyn Lindsay, Reporting Planner and Pete Ravenscroft and Ciaran Campbell ORC Resource Scientists. Representatives of the applicants and the applicant's agent Will Nicholson of Landpro also attended.

2. Key Issues

I believe that the key issues with this application are:

- Consent duration;
- Rate and volume of take; and
- The need for a residual flow

3. Description of the Proposed Activity

The applicant is seeking to replace their existing deemed permits (96320 and 96321) to take surface water from Breakneck Creek (an Amisfield Burn tributary) and the Amisfield Burn into the Amisfield race for the purpose of stock water and irrigation within the Five Mile Creek catchment. The applicant is also seeking to replace deemed permits 94394 and RM15.007 for the taking of surface water from the Park Burn. In addition, they are seeking to retake water from the Park Burn, a tributary of the Park Burn and Five Mile Creek, being water that is discharged to these tributaries via the Amisfield race and Park Burn race. Image 1 below shows the location of the points of take, retakes and race networks.

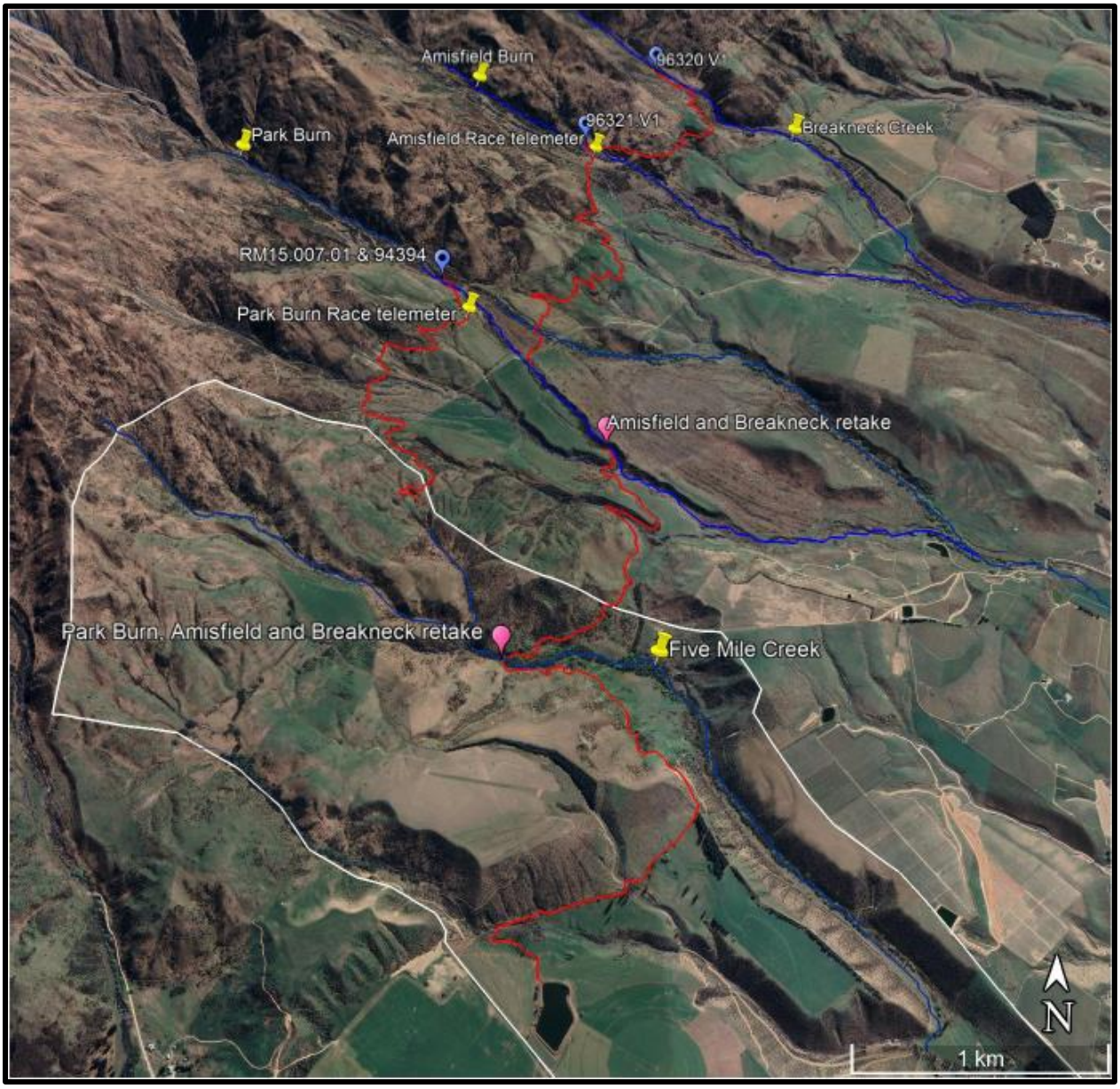

Image 1: Overview of the applicant's take and race infrastructure

The applicant's current deemed permits for the Amisfield Burn and its tributary (Breakneck Creek) (96321 and 96320) allow surface water to be taken from the Amisfield Burn catchment up to 350,000 l/hour (approximately 97 l/s). The Amisfield Race discharges surface water from the Amisfield Burn catchment into the Park Burn catchment to the southwest. The application states

that it would be very difficult and costly for the applicant to separately meter the Amisfield and Breakneck takes, and, as such, the applicant seeks that a single permit with just one instantaneous limit of 97.3 L/s be issued as replacement for deemed permits 96320 and 96321.

The applicant also seeks renewal of deemed permit 94394, which allows surface water to be taken from the Park Burn at a rate of approximately 28 l/s into the Park Burn Race (located above the Amisfield Race discharge into the Park Burn). The applicant also holds water permit RM15.007.01, which allows for a take (at the same location of deemed permit 94394) of 222 l/s from the Park Burn.

RM15.007.01 (granted in 2015), authorised the transfer of the point to take on the Park Burn (as authorised by deemed permit 96470) to a lower (downstream) point of take. The original point of take was destroyed by flooding in 1999. The point of take under permit 96470 was moved to the existing point of take established under 94394. RM15.007.01 essentially replaces 96470, which was surrendered.

The two takes from the Park Burn (94394 and 15.007.01) are diverted via the Park Burn Race to the Five Mile Creek catchment to the southwest. The point of take for the Park Burn Race (RM15.007.01 and 94394) is upstream of the point of discharge of the Amisfield Race into the Park Burn. The applicant operates a telemetered water meter for the Park Burn Race just below the point of take (RM15.007.01 and 94394).

The combined authorised rate of take from the Park Burn under RM15.007.01 and 94394 is approximately 250 l/s. The applicant states that abstraction data from the Park Burn Race metering site indicates that up to 150 l/s, at most, since 2013 has been abstracted. Based on this, the applicant is proposing to reduce the combined maximum rate of take to 120 l/s to better reflect their requirements under a proposed replacement consent that combines deemed permit 94394 and RM15.007.01 into a single consent.

The applicant is also proposing to retake the total 97 l/s of water (sourced from the Amisfield Burn catchment) from the Park Burn via another race located to the south of the Amisfield Race point of discharge into the Park Burn. This race diverts water sourced from the Park Burn (bolstered by the 97 l/s discharge sourced from the Amisfield Burn catchment) to Five Mile Creek.

The applicant is proposing to retake up to 217 l/s (97 l/s from the Amisfield Burn catchment plus 120 l/s from the Park Burn catchment) from Five Mile Creek via a race that further diverts water southwest to the applicant's two storage ponds (combined storage of 140,000 m^3) in the vicinity of the Applicant's 320 ha irrigation area and stock supply (currently serving around 7,000 sheep and 250 cattle).

The proposed retake of water (sourced from the Park Burn and Amisfield Burn catchments under the deemed permits described above) at Five Mile Creek is at the original location of permit 96322, which is now surrendered by the applicant. The applicant states that Five Mile Creek is not abstracted from and serves effectively as infrastructure connecting the two race networks (Amisfield Race and Park Burn Race) within the Five Mile Creek catchment.

The details of the applicant's race infrastructure is set out at Table 1:

Table 1: Summary of applicant's race infrastructure

Description	Approx. location (NZTM2000)
Discharge of Breakneck Creek water to the Amisfield Burn	1300937E 5018672N
Park Burn trib water piped under race	1300882E 5018084N
Park Burn trib water piped under race	1300619E 5017509N
Race discharged into Park Burn	1300629E 5017054N
Re-take of Breakneck Creek and Amisfield Burn water from the Park Burn	1301017E 5016576N
Race piped over Sawyers Gully	1300990E 5016472N
Park Burn, Amisfield Burn and Breakneck Creek re-take from Five Mile Creek	1300507E 5015359N

3.1 Rates and Volumes Applied For

Rate of take: 217.3 l/s being; Breakneck Creek/Amisfield Burn - 97.3 l/s and Park Burn – 120l/s
Monthly Volume: 490,302 m^3/month (irrigation only) plus 1860 m^3/month (stock water)
Annual volume: 2,297,463 m^3/year (irrigation only) plus 21,900 m^3/year (stock water)

3.2 Details of Deemed Permit Being Replaced

Deemed Permits 96320 and 96321 authorise the combined abstraction of 97.2 L/s (350,000 L/hour) of water from Breakneck Creek and the Amisfield Burn, with metering since April 2013. The two permits replaced part of WR766Cr which was jointly held between Smallburn Limited (Previously W E Clark, R J Clark and P Morton) and the neighbouring property (Lowburn Landholdings Partnership Limited, previously McTanish and Swiffen). Permits 96320.V1 and 96321.V1 replaced the share of water held by Smallburn Limited. Lowburn Landholdings applied for the replacement of their share separately, which split the joint permit into three permits. This application relates to the replacement of 96320.V1 and 96321.V1.

RM15.007.01 was granted to Smallburn Limited in April 2015 and authorised the transfer of the point of take for Deemed Permit 96470. Combined RM15.007.01 and 94394 authorise a maximum abstraction rate of 249.8 L/s (900,000 L/hr) from the Park Burn and the take has been metered since April 2013.

Abstractions under 96320, 96321 (combined), 94394 and RM15.007.01 (combined) are metered. Both meters are located down-race from the points of take (due to issues of communication, maintenance and other practicalities), and corresponding WEXs are held.

Additionally, the applicant is also seeking resource consent for the re-taking of water from a tributary of the Park Burn and Five Mile Creek as detailed below:

Table 2: Summary of Smallburn Limited proposed retake permits

Permit	Details	Watercourse
Consent to re-take (proposed)	To retake up to 97.3 L/s of Breakneck Creek and Amisfield Burn water from a tributary of the Park Burn.	Park Burn tributary
Consent to re-take (proposed)	To retake up to 217.3 L/s of Breakneck Creek, Amisfield Burn and Park Burn water from Five Mile Creek.	Five Mile Creek

This application was lodged with the Council at least six months before the expiry date and is for the same activities as the current deemed permits. In accordance with Section 124 of the Act, the applicant may continue to operate under Deemed Permits 96320, 96321, 94394 and RM15.007.01 until a decision on this application is made and all appeals are determined.

The applicant holds also Water Permit 2000.430, authorising the abstraction of Five Mile Creek water approximately 2 km northwest of SH6. This permit authorised the abstraction of water near to the applicant's house, which has in the past been used for domestic purposes, some stock drinking water and a small area of irrigation. This permit is not to be replaced as it has no water abstraction records, and the applicant has not utilised this permit for some time.

Historic Rate and Use Data and Deemed Permit Conditions
The applicants existing deemed permits are included in the table below:

Table 3: Summary of Smallburn Limited existing permits

Permit	Details	Watercourse	Conditions
Deemed Permit 96320.V1	To take and use up to 200,000 L/hour (55.6 L/s) from Breakneck Creek for irrigation. Combined maximum with 96321.V1 of 350,000 L/hour (97.3 L/s).	Breakneck Creek (tributary of Amisfield Burn)	200,000 litres per hour from Breakneck Creek as of 25 November 1866, 150,000 litres per hour from Amisfield Burn as of 25 November 1866 and 50,000 litres per hour from Masons Gully as of 25 November 1866. Permits which can exercise priority over this permit: WR766Cr (Amisfield Burn)

			Permits over which this permit can exercise priority: WR2000Cr/WR2000Cr, WR4975Cr and WR6686CR. The total volumes of water taken under this Deemed Permit and Deemed Permit 96321.V1 and any variations to it shall not exceed 350,000 litres per hour.
Deemed Permit 96321.V1	To take and use up to 150,000 L/hour (41.7 L/s) from the Amisfield Burn for irrigation. Combined maximum with 96320.V1 of 350,000 L/hour (97.3 L/s).	Amisfield Burn	The following priorities attach to mining privilege WR766Cr which gives rise to this deemed permit. 200,000 litres per hour from Breakneck Creek as of 25 November 1866, 150,000 litres per hour from Amisfield Burn as of 25 November 1866 and 50,000 litres per hour from Masons Gully as of 25 November 1866. Permits which can exercise priority over this permit: WR766Cr (Amisfield Burn) Permits over which this permit can exercise priority: WR2000Cr/WR2000Cr, WR4975Cr and WR6686CR. The total volumes of water taken under this Deemed Permit and Deemed Permit 96320.V1 and any variations to it shall not exceed 350,000 litres per hour.
Water Permit RM15.007.01	To take and use up to 222 L/s (800,000 L/hour) from the Park Burn for irrigation	Park Burn	The total abstraction authorised by this permit shall not exceed:

(replaced 96740)	and stock water. Same take location as 94394.		(a) 222 litres per second; and (b) 800 cubic metres per hour; and (c) 19,200 cubic metres per day. (d) 572000 cubic metres per month (d) 2,816,817 cubic metres per year Condition 6 of RM15.007.01 requires "a residual flow of no less than 10 litres per second…immediately downstream of the point of take". Fish screening, metering and a review condition are also imposed.
Deemed Permit 94394	To take and use up to 100,000 L/hour (27.8 L/s) from the Park Burn for the purpose of irrigation. Same take location as RM15.007.01.	Park Burn	This permit has priority dating from 28 December 1878 Licence/permits/rights which can exercise priority over this permit. (Higher priority ranking, sited downstream): None (WR1097Cr, 10.3.1866 has higher priority, but is sited upstream. No licence/permit/right in the Clutha River, downstream from the Park Burn confluence has higher priority ranking). Licences/permits/rights over which this permit can exercise priority (Lower priority ranking, sited upstream): None (WR75Cr, 20.1.1880, WR1798Cr 14..2.96 lower priority, and permit Nos 93204 and 3185, no priority, are all sited downstream).

Rates and volumes for this take have been recorded from 2013 – 2020 and are discussed further in Section 7.2 below.

Other Activities

Stock drinking requirements are in addition to the allocation sought for irrigation, as the RMA does not place a limit on water taken for an animal's drinking needs. *Section 14(3)(b)(ii) states that:*

> *A person is not prohibited by subsection (2) from taking, using…any water…if…the water…is required to be taken or used for...the reasonable needs of a person's animals for drinking water, and the taking or use does not, or is not likely to have an adverse effect on the environment.*

The stock water requirements have been included as part of this application and the efficiency of use for this purpose has been assessed in section 7.6.2.1 of this report. It is noted that the applicant can exercise their Section 14(3)(b)(ii) rights outside of the permit. Stock water requirements are detailed in Table 4 below.

Table 4: Stock water requirements

Volume	Daily (m3)	Monthly (m3)	Annual (m3)
Stock drinking requirements	60	1,825	21,900

Three discharges of water to water occur as part of the proposal:

- Breakneck Creek water to the Amisfield Burn, via the Amisfield Race.
- Amisfield Burn water to a tributary of the Park Burn, via the Amisfield Race.
- Park Burn water to a tributary of Five Mile Creek, via the Park Burn Race.

These are permitted activities under Rule 12.C.1.1 of the RPW:

> *The discharge of water or any contaminant to water, or onto or into land in circumstances which may result in a contaminant entering water, is a permitted activity.*

None of the provisions that might confound the permitted status of these activities (i.e. causing flooding, discharge between catchments, etc.) are triggered by the three discharges.

In addition, the applicant may, at times, need to conduct maintenance to the intake infrastructure. This will involve instream works, and is a permitted activity under Rule 13.5.1 of the RPW:

> *The disturbance of any lake or river…and any resulting discharge or deposition of bed material associated with: (iii) The maintenance or reinstatement of a water intake, in order to enable the exercise of a lawful take of water…is a* ***permitted activity.***

The storage reservoirs do not capture natural run-off and are not located within a watercourse. They do not meet the definition of large dam under the Building Act and the damming can meet the permitted activity rules of the RPW. The retake of primary allocation water from the reservoirs for use on the applicant's property is considered as part of the relevant rules that apply to the

primary allocation takes from the Amisfield Burn, Breackneck Creek and the Park Burn. No additional consents are required for these takes.

3.3 Application Documents

The application was lodged with Council on 17 December 2019 and the application included the following documentation:

The applicant provided the following reports in support of the application:

- Form 1 and Form 4
- Assessment of Environmental Effects -14 January 2019
- Fish Survey and Residual Flow report - Waterways Consulting dated May 2019
- Park Burn Hydrology investigation– Landpro Limited dated 28 May 2019
- Aqualinc Calculations – Landpro Limited

Additional information relating to a residual flow for the Amisfield Burn was requested on 27 February 2020. In respect of a residual flow, the applicant notes that:

> *"The applicant's intakes on Breakneck Creek (96320) and the Amisfield Burn (96321) are both open channel diversions, meaning they never take the full flow of the respective creek. Generally speaking, roughly 50% of the flow in each creek is allowed to pass the intakes, even during low flows. Quantifying a residual flow past the intakes would be very difficult, therefore a consent condition requiring the applicant to leave approximately 50% of the natural flow in the creek past the intakes may be considered acceptable by RSU/ORC."*

The applicant also offered a further condition following consultation with the Department of Conservation which sought that:

> *"The consent holder shall maintain a visual residual flow immediately downstream of the waterfall below the Amisfield Burn intake, at approximately NZTM 1300939E 5018657N"*

It is noted that a visual residual flow at this location would likely be met if 50% of the flow is left in the Amisfield Burn below the point of take at all times.

4. Notification and Submissions

4.1 Notification Decision

The applicant requested limited notification to those affected parties who were identified by Council on 17 March 2020. The application was limited notified on 15 June 2020. The application was notified to:

- Aukaha Limited on behalf of local runanga - Kāti Huirapa Rūnaka ki Puketeraki and Te Rūnanga o Ōtākou;
- Te Ao Marama on behalf of local runanga – Te Runanga o Waihopai
- Te Runanga o Ngai Tahu
- Department of Conservation
- Lowburn Land Holdings Limited

- Rockburn Wines Limited
- Mark II Limited

The reasons for these parties being considered affected are included in the notification recommendation (ORC Reference A1333162). The submission period closed on 13 July 2020.

4.2 Submissions Received

Submissions were received from the following:

- Aukaha Limited;
- Te Au Marama Limited

A Late Submission was received from Mark II Limited. This submission was received on 20 July 2020.

4.2.1 Summary of Submissions

Table 5: Summary of Submissions

Submitter	Submission Points	Wishes to be heard
Te Ao Marama Limited	Nga Runanga seek that the consent be declined or if granted then the following conditions imposed: • That the consent term is a maximum of 6 years. • That fish screens are consistent with NIWA Fish Screening Guidelines. • Flows left in the waterway should be consistent with national direction. • That the water take is metered in accordance with national direction.	Yes
Aukaha Limited (on behalf of Te Rūnanga o Moeraki, Kāti Huirapa Rūnaka ki Puketeraki, Te Rūnanga o Ōtākou and Hokonui Rūnanga)	Nga Runanga are not confident in the regional planning framework and request a short-term consent to allow a new planning framework to be established before longer term consent is granted. Nga Runanga seek that the consent be declined or if granted then the following conditions imposed: • That the term of consent be no longer than 6 years. • A minimum flow of 90% of the mean annual low flow (MALF) as calculated by the regional council and an allocation limit of, whichever is greater of:	Yes

	▪ 30% of MALF as calculated by the regional council • Retain existing requirements for water meter(s) and ensure results continue to be recorded and reported via telemetry.	

4.2.2 Late Submission

A late submission was received from Mark II Limited on 20 July 2020. The submission period closed on 13 July 2020. The submission is summarised below. Acceptance of the submission is at the discretion of the Commissioner.

Table 6: Summary of Late Submission

Submitter	Submission Points	Wishes to be heard
Mark II Limited	Submission relates to RM20.003 and RM20.007, Requests that the late submission from RM20.007 be accepted. Mark II Limited advises that the status of 93177 as outlined in the application does not, in its opinion, accurately reflect the legal status of 93177 which lapses on 1 October 2021 and, may still be subject to an application by Mark II Limited. The submitter Seeks that downstream water users be taken into account when setting residual flows or before granting continued allocation. Seeks that the relativity of Deemed Water Permit 93177 as held by Mark II Limited be duly recognised.	Yes

5. Description of the Environment

5.1 Description of the Site and Surrounding Environment

The applicant's property boundary encompasses approximately 1,000 hectares of land on the flanks of the Pisa Range, with elevation ranging from 700 metres above sea level (masl) at the top end of the property to approximately 300 masl at the bottom end. The irrigation command

area is located on the bottom (eastern) half of the property, where slopes are gentler and access to infrastructure is more readily available.

The applicant runs merino sheep and cattle on their property as well as a homestay operation that utilises the farming enterprise as a tourism venture. This property has been owned by the Morton and Clark family for almost 100 years and is described as a sheep breeding and finishing property with some cattle store stock trading.

Methods of irrigation include centre pivot (approximately 187 ha currently and 36 ha proposed), K-Line (approximately 24 ha) and flood irrigation (approximately 23 ha). A reticulated stock water supply is fed from the storage pond. Peak stocking units comprise approximately 7,000 sheep and 250 beef cattle and the applicant proposed to increase sheep stocking numbers to 10,000 units.

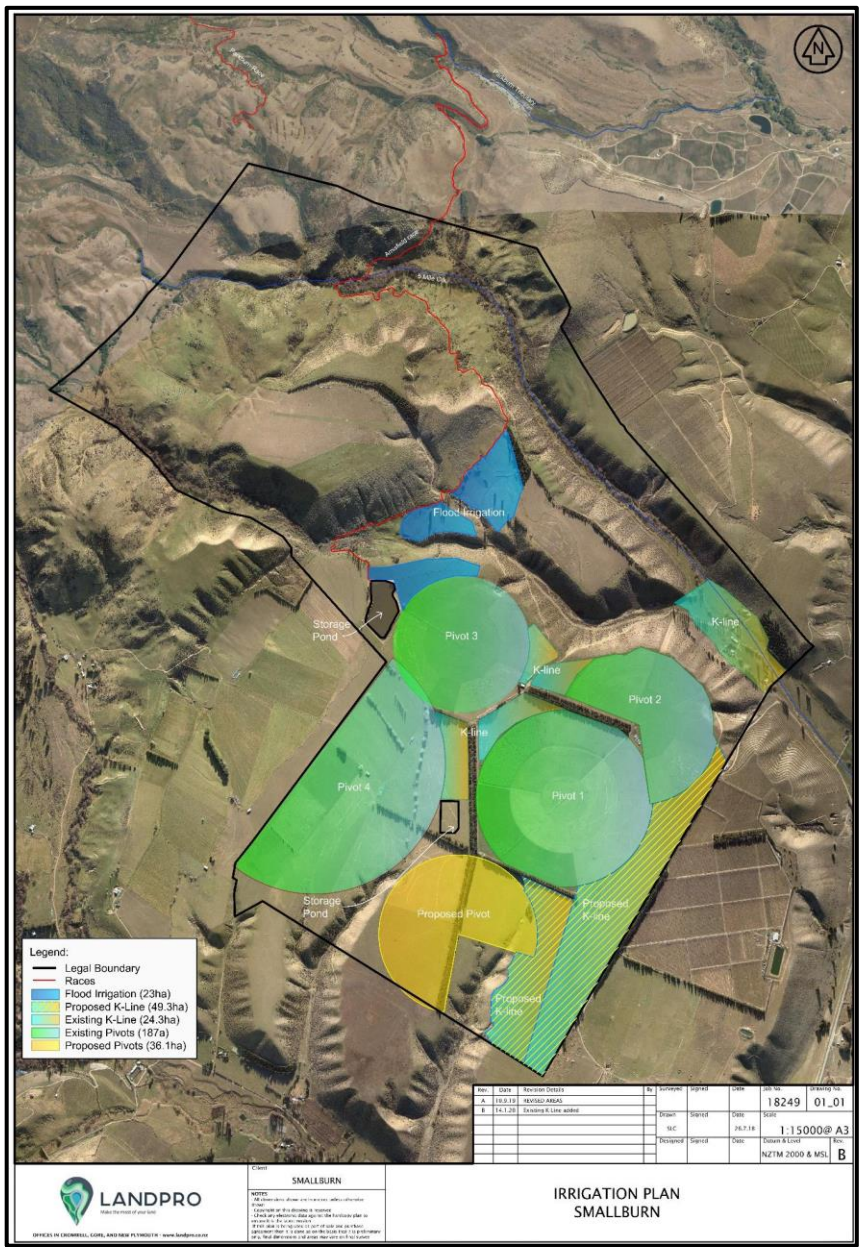

Image 2: Applicable Smallburn Ltd irrigation areas (Source : Application)

The applicant operates two overall water conveyance systems: one which transports Breakneck Creek water (96320) and Amisfield Burn water (96321) to its irrigation areas as detailed below:

The Amisfield Race uses a tributary of the Park Burn to convey water. The other conveyance system has just one take point on the Park Burn (where two permits authorise abstraction being RM15.007.01 and 94394), utilising a race to transport Park Burn water in a southwest direction to the applicant's property.

This race uses Five Mile Creek to convey water down to the Amisfield Race. At this point, all water delivered to Five Mile Creek (Amisfield, Breakneck and Parkburn) is re-taken from Five Mile creek and raced the rest of the way to the applicant's storage and irrigation areas. All of the applicant's take points are located on land owned by Mt Pisa Station, (legally described as Lot 3 DP 343853 as contained in Record of Title 180117) with the exception of the re-take from Five Mile Creek which is located on the applicant's own property. The application refers to these races as the Amisfield Race and the Park Burn Race.

The Amisfield Race begins life at Breakneck Creek (a tributary of the Amisfield Burn), whereby an open channel collects a portion of the creek water (Breakneck intake). From here, water is conveyed down race to the Amisfield Burn, traversing the flanks of the Pisa Range. Breakneck Creek water is discharged into the Amisfield Burn, essentially augmenting Amisfield Burn flows.

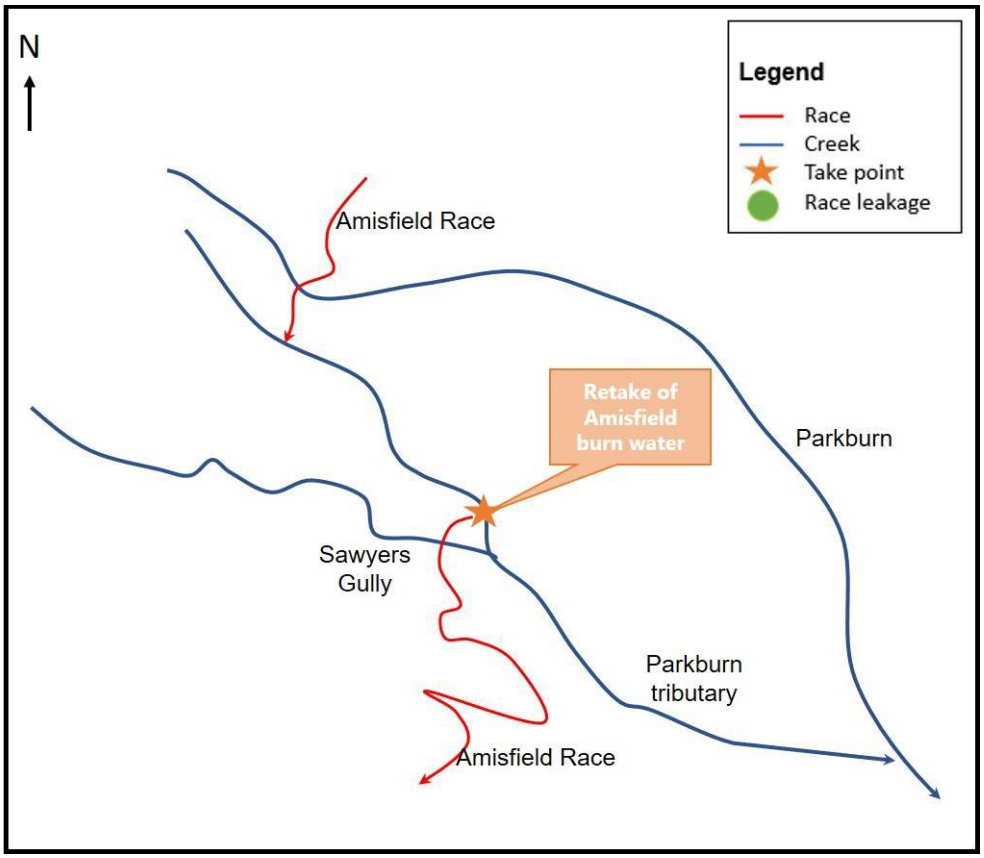

Image 3: Park Burn tributary re-take schematic (Source: Application)

On the opposite bank of the Amisfield Burn, water enters the second section of the Amisfield Race via the 96321 intake (now conveying both Breakneck Creek and Amisfield Burn water). A waterfall

is located immediately downstream from the 96321 intake. Water pools behind this embankment and flows down the race when it is opened.

From here, water flows along the Amisfield Race for approximately 2.8 km, at which point it discharges into the top of a tributary of the Park Burn. 96320 and 96321 water is then retaken from the Park Burn tributary approximately 600 m downstream of where it is dropped in, then raced for approximately 5.5 km before discharging into the applicant's storage ponds.

The applicant operates a water meter on the Amisfield Race, at approx. NZTM 1300971E 5018554N (around 1,100 and 100 metres downstream from the Breakneck Creek and Amisfield Burn intakes, respectively). WEX0123 authorises the operation of this meter downstream from the two take points. Combined abstraction records for the Breakneck (96320) and Amisfield (96321) takes are telemetered to Council, and the meter was verified last year.

The combined intake for permits RM15.007.01 and 94394 is located in the upper reaches of the Park Burn, at approximately NZTM 2000 1300163E 5017553N. The Park Burn intake is an open channel that allows Park Burn water to gravity-feed into the race. From the intake, the water race traverses the flanks of the Pisa Range for approximately 2.7 km before discharging into the headwaters of a Five Mile Creek tributary. The race crosses several small gullies (catchment < 50 ha) and is piped under a tributary of the Park Burn at approximately NZTM 2000 1299816E 5016828N.

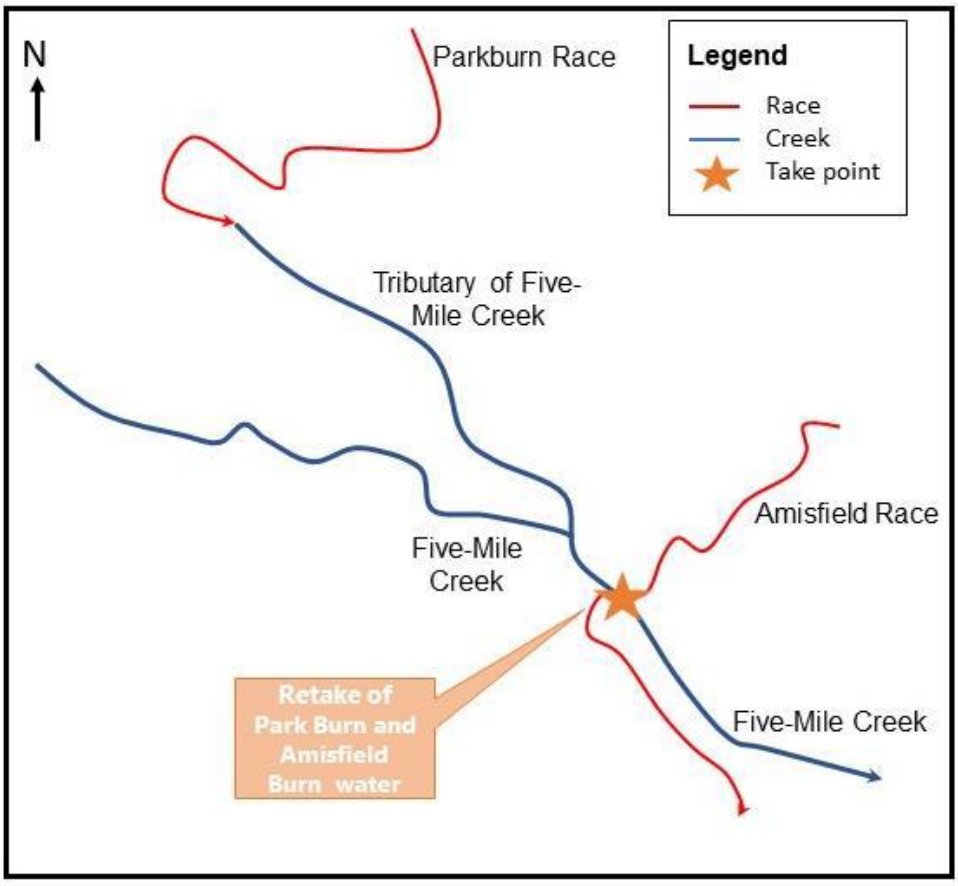

Image 4: Five Mile Creek re-take schematic (Source: Application)

After being discharged into the Five Mile Creek tributary, RM15.007.01 and 94394 water is retaken from the main stem of Five Mile Creek approximately 1 km downstream, along with 96320 and 96321 water from the Amisfield Race.

Water is conveyed to a recently expanded irrigation pond for storage and used for flood irrigation directly beneath the race. The storage pond is 2.5 m deep and has a capacity of 120, 000m^3. A second storage pond is 2.7 m deep and has a capacity of 20,000 m^3. Stored water is piped from this storage pond around the applicant's property to the current irrigation areas comprising 320 ha in total. Water is used on Lot 4 DP 481936 as contained in Record of Title 677069 and is owned by the applicant.

Virtually all of the irrigation area is classified in the New Zealand Land Cover Database as high producing exotic grassland, which is consistent with the improved pastures and winter crops sown at these locations. Vegetation in the vicinity of the applicant's points of take and retake is generally comprised of willows, rosehip and exotic grasses.

The application area is subject to characteristically hot, dry summers and cold winters. MAR for the irrigable land areas is estimated at 450 mm/year, based on ORC's GIS viewer. Landcare research SMap-designated soils within the command area are summarised in the Soils Map, provided in Appendix A. The GNS Science New Zealand Geology Web Map indicates that virtually all of the land within the irrigation command area is underlain by Middle Quaternary glacial outwash deposits, described as 'muddy to sandy gravel'.

5.2 Description of Surface Water Body

Amisfield Burn and Breakneck Creek

The headwaters of the Amisfield Burn originate at the top of the eastern face of the Pisa Range, at an elevation of approximately 1,880 masl and just below the Column Rocks. The upper reaches of the catchment are steep and incised, with a sharp drop down to approximately 800 masl, where the channel begins to widen and a valley begins to form. Below the take point, the channel becomes less confined, picking up several smaller tributaries and flowing across degraded gravel beds before it's confluence with Lake Dunstan.

Breakneck Creek is a tributary of the Amisfield Burn, with its headwaters located to the north of the main trunk of the Amisfield Burn. The morphology and characteristics of the creek are similar to that of the Amisfield, and it joins the Amisfield Burn approximately 2.3 km downstream from the take point.

ORC has maintained a flow meter in the Amisfield Burn above all abstraction (approx. 1 km above the applicant's take point) since October 2013. The creek follows the typical behaviour of steep headwater streams, with fast response event-specific hydrographs. Highest flows tend to be during spring and early summer, corresponding to snowmelt runoff, with a notable drop in flows in the new year. Based on the ORC's flow data for the Amisfield Burn, the mean annual flow is 162 L/s and the 7-day MALF is 65 L/s.

No flow monitoring data is available for Breakneck Creek, however MfE river flow modelling estimates the mean flow of Breakneck Creek in the vicinity of the applicant's take point to be 63 L/s, with a MALF of 19 L/s.

On 15 January 2019, the applicant's agent undertook a series of flow gauging's at various sites throughout the Amisfield Burn. A total of five reaches were assessed. A flow assessment was also conducted on the upper reach of Breakneck Creek, above the point of take. For the duration of the survey and for 24 hours prior the applicants ceased taking water from their respective points of take. The applicant suggests that the flow gauging's demonstrates that flow in the lower reaches of the Amisfield Burn interacts with the underlying fine loose alluvial gravels resulting in a net loss of 210 L/s between the Amisfield Burn/Breakneck Creek confluence and the final gauging site located well above Lake Dunstan, where the creek had run dry or gone to ground.

Eight records for the Amisfield Burn are registered on the New Zealand Freshwater Fish Database (NZFFD):

- The earliest three (1996) records report brown trout at all three sites, a single large koaro at the middle site, and a single upland bully in a lower tributary of the Amisfield Burn
- 2001 surveys reported no fish at State Highway 6 and brown trout and a single koaro were present at the same site as the koaro was found in 1996.
- In 2018, three Amisfield Burn sites were fished with brown trout present at the lower two sites, upland bully at the lowest site, and no fish recorded at the uppermost survey site. Note that the second highest survey site on the Amisfield Burn is effectively the same location as the applicant's intake.
- Breakneck Creek in the vicinity of the applicant's take point was fished in 2018, with no species identified.

Water Ways Consulting Ltd conducted three surveys on the Amisfield Burn and Breakneck Creek in April 2019 to fill in any data gaps in the historic fish survey record (see below figure). The surveys found brown trout at the two Breakneck Creek sites, while the Amisfield Burn survey site (just 700 m upstream of the applicant's point of take, at the uppermost (95789) abstraction point) did not record any fish. No additional surveys of the lower reaches of the creek were possible, as the creek bed was dry at State Highway 6.

There are no Water Conservation Orders on the Amisfield Burn and Breakneck Creek.

Park Burn

The geohydrology of the Park Burn is similar to that of the Amisfield Burn, with its headwaters beginning at around 1800 masl on the Pisa Range. After a steep descent, the channel gradient eases at an elevation of around 650 masl, with the applicant's take point located approximately 1.3 km downstream from this point. The Park Burn then meanders across the terraces below the Pisa Range foothills before passing under SH6 and ultimately discharging into Lake Dunstan.

There is no flow monitoring data for the Park Burn, however MfE river flow modelling estimates the mean flow of the Park Burn in the vicinity of the applicant's take point to be 123 L/s, with a MALF of 34 L/s. As for the Amisfield Burn, gauging was undertaken by the applicant's agent on January 16, 2019 to quantify Park Burn flows at various sites throughout the catchment.

The flow gauging commissioned by the applicant also identifies surface water losses for the Park Burn between the upstream reaches of the creek and the lower reaches, with a net loss of 70 L/s between the second gauging site and the bottom gauging site. No gauging was undertaken below the State Highway.

Three records for the Park Burn are registered on the New Zealand Freshwater Fish Database (NZFFD) being brown trout only, with no other species present. Waterways Consulting Ltd conducted further aquatic surveys of the Park Burn in April 2019. Brown trout were identified at several sites on the Park Burn, with a single rainbow trout found at one site. No native fish were identified in the Park Burn.

There are no Water Conservation Orders on the Park Burn.

Five Mile Creek

Five Mile Creek has a considerably smaller catchment than the Amisfield Burn and the Park Burn, with its headwaters originating in on the lower flanks of the Pisa Range, at approximately 900 masl. Little hydrological data is available for the creek. MfE river flow modelling estimates the naturalised flow of Five Mile Creek in the vicinity of the applicant's Amisfield Race crossing to be 24 L/s mean flow with a MALF of 5 L/s, however it is possible that flows may reflect inputs from the Park Burn Race into the Five Mile Creek tributary. The applicant advises that they don't see flowing water in Five Mile Creek unless there has been a recent rainfall event.

There are no fish survey records listed on NIWA's freshwater fish database, however it is assumed that due to the small stature of the creek and its assumed lack of connectivity with Lake Dunstan, there are relatively few ecological values associated with this watercourse.

There are no Water Conservation Orders on Five Mile Creek.

Other Water Users

The following table provides a summary of current water users on the Amisfield Burn (including Breakneck Creek) and Park Burn. Five Mile Creek has been omitted from the table as the applicant is the only water user identified on that creek.

Table 7: Summary of other water users on the Breakneck Creek, the Amisfield Burn and the Park Burn

Permit No.	Creek	Location	Rate of take (l/s)	Primary consent holder	Current application lodged with ORC
97358	Breakneck Creek	Approximately the same location as the 96320 take.	55.6	LLHLP	Identified as "not to be renewed" in RM20.020
95789	Amisfield Burn	Approx. 680 m u/s of the 96321 take.	166.7	Pisa Holdings Limited	RM20.005
97232	Amisfield Burn	Approx. 2.4 km d/s of the 96321 take.	83.3	LLHLP	RM20.020
98526	Park Burn	Approx. 2.5 km d/s of the RM15.007.01/ 94394 take.	27.8	Rockburn Wines Limited	RM20.003
93177	Park Burn	Approx. 1.3 km d/s of the	55.6	Mark II	Potentially unexercised[1]

[1] Note that the late submission of Mark II Limited refutes that the 93177 is unexercised

		RM15.007.01/ 94394 take.			

5.3 Schedule 1 of the Regional Plan: Water

Schedule 1A of the Regional Plan: Water for Otago (RPW) outlines the natural and human use values of Otago's surface water bodies.

The Park Burn, Five Mile Creek and Breakneck Creek are not listed in Schedule 1 of the RPW.

The Amisfield Burn is identified in Schedule 1A with the following values listed:

- Weedfree (absence of aquatic pest plants)
- Rarefish (presence of indigenous fish species threatened with extinction).

In relation to the "rarefish" designation, the Amisfield Burn is identified within the Schedule as "significant habitat for koaro."

The Amisfield Burn and Park Burn are tributaries of Lake Dunstan/Te Wairere which is part of the Clutha River/Mata-Au catchment. The following Schedule 1A values are identified for Clutha River/Mata-Au:

- Size (large waterbody supporting high numbers of particular species or a variety of habitats)
- Bedrock and gravel beds
- Areas for spawning and juvenile fish development for trout and salmon
- Riparian vegetation
- Significant presence of trout, eel and salmon
- Presence of indigenous fish species.
- Significant habitat for flathead galaxid
- Presence of a significant range of indigenous waterfowl.

Schedule 1B of the RPW identifies water takes used for public supply purposes (current at the time the RPW was notified in 1998). The Amisfield Burn, Park Burn, Five Mile Creek and Breakneck Creek are not identified in Schedule 1B. However, Site 13 (Clyde Water Supply) and Site 14 (Cromwell Water Supply) of Schedule 1B are both within the Clutha River/Mata Au catchment downstream of the confluence of the Amisfield and Park Burns and the Clutha River/Mata Au.

Schedule 1C identifies registered historic places which occur in, on, under or over the beds or margins of lakes and rivers. The Amisfield Burn, Park Burn, Five Mile Creek and Breakneck Creek are not identified in Schedule 1B. However, the Cromwell Bridge located downstream of the confluence of the Amisfield and Park Burns and the Clutha River/Mata Au. is a registered historic place.

Schedule 1D of the RPW identifies the spiritual and cultural beliefs, values and uses associated with water bodies of significance to Kai Tahu. The Amisfield and Park Burns are not listed within this Schedule, however the Clutha River/Mata Au (to which the watercourses flows) is identified as having the following values:

- **Kaitiakitanga:** the exercise of guardianship by Kai Tahu, including the ethic of stewardship.
- **Mauri:** life force.

- **Waahi tapu and/or Waiwhakaheke:** sacred places; sites, areas and values of spiritual values of importance to Kai Tahu.
- **Waahi taoka:** treasured resource; values, sites and resources that are valued.
- **Mahika kai:** places where food is procured or produced.
- **Kohanga:** important nursery/spawning areas for native fisheries and/or breeding grounds for birds.
- **Trails:** sites and water bodies which formed part of traditional routes, including tauraka waka (landing place for canoes).
- **Cultural materials:** water bodies that are sources of traditional weaving materials (such as raupo and paru) and rongoa (medicines).

5.4 Schedule 2 of the Regional Plan: Water

The Amisfield Burn, Park Burn, Five Mile Creek and Breakneck Creek are not listed in Schedule 2 of the RPW.

5.5 Regionally Significant Wetlands

There are no regionally significant wetlands identified within or near these watercourses.

6. Status of the Application s77A and s87A

Resource consent is required under the RPW and proposed Plan Change 7 (Water Permits) of the RPW (PPC7).

Table 8: Planning Rules

Planning Instrument	Rule	Purpose	Activity Status
RPW	Rule 12.1.4.5	Taking and use of surface water as primary allocation	Restricted Discretionary
RPW	Rule 12.1.4.1	The taking and use of surface water from any lake or river which has already been delivered to that lake or river for the purpose of this subsequent taking.	Restricted Discretionary
PPC7	Rule 10A.3.2.1	Taking and use of surface water as primary allocation which does not meet Rule 10A.3.1.1	Non-Complying

PPC7 was notified for submissions by Council on 18 March 2020 and has immediate legal effect in accordance with section 86B(3) of the Act. PPC7 was renotified on 6 July 2020 by the Environmental Protection Agency. PPC7 introduces two new rules relating to water takes which have immediate legal effect upon notification.

Under s88A of the RMA an application for a resource consent continues to be processed for the type of activity that applied when an application was made, despite an activity status changing as a result of proposed plan change being notified. As this application was lodged prior to notification of PPC7, it will retain the activity status that it had under the operative rules in the RPW. The proposal is assessed as a Restricted Discretionary Activity.

7. Section 104 Effects Evaluation

Section 104(1)(a) of the RMA requires the council to have regard to any actual and potential effects on the environment of allowing the activity. This includes both the positive and the adverse effects.

7.1 Ecological Effects

I consider that the adverse effects of the activity on the environment relate to:

- Allocation availability
- Minimum flows
- Instream values
- Downstream users and competing demand for water
- Groundwater

7.1.1 Surface Water Allocation Availability

Primary allocation is defined by Policy 6.4.2(b) of the RPW:

"To define the primary allocation limit for each catchment, from which surface water takes and connected groundwater takes may be granted, as the greater of:

(a) That specified in Schedule 2A, but where no limit is specified in Schedule 2A, 50% of the 7-day mean annual low flow; or

(b) The sum of consented maximum instantaneous, or consented 7-day, takes of:

(i) Surface water as at: 19 February 2005 in the Welcome Creek catchment; or 7 July 2000 in the Waianakarua catchment; or 28 February 1998 in any other catchment; and

(ii) Connected groundwater as at 10 April 2010, less any quantity in a consent where:

(1) In a catchment in Schedule 2A, the consent has a minimum flow that was set higher than that required by Schedule 2A.

(2) All of the water taken is immediately returned to the source water body.

(3) All of the water being taken had been delivered to the source water body for the purpose of the subsequent take.

(4) The consent has been surrendered or has expired (except for the quantity granted to the existing consent holder in a new consent).

(5) The consent has been cancelled (except where the quantity has been transferred to a new consent under Section 136(5).

(6) The consent has lapsed."

As noted above the following flow data has been established:

- Based on the ORC's flow data for the Amisfield Burn, the mean annual flow is 162 L/s and the 7-day MALF is 65 L/s.

- No flow monitoring data is available for Breakneck Creek, however MfE river flow modelling estimates the mean flow of Breakneck Creek in the vicinity of the applicant's take point to be 63 L/s, with a MALF of 19 L/s.

- There is no flow monitoring data for the Park Burn, however MfE river flow modelling estimates the mean flow of the Park Burn in the vicinity of the applicant's take point to be 123 L/s, with a MALF of 34 L/s.

- MfE river flow modelling estimates the naturalised flow of Five Mile Creek in the vicinity of the applicant's Amisfield Race crossing to be 24 L/s mean flow with a MALF of 5 L/s, (note the applicant's caution that it is possible that this may reflect inputs from the Park Burn Race into the Five Mile Creek tributary).

Notwithstanding the MALF calculations above, the sum of the consented primary allocation takes are as follows:

- Breakneck Creek 111.2 l/s (comprising 55.6 l/s held by Lowburn Landholdings and the applicant's allocation under 96320.V1)
- Amisfield Burn - 291.7 l/s (including the allocation under 96321.V1 held by the applicant)
- Park Burn – 278 l/s (comprising the existing take by RockBurn Wines Limited - 98526.V1 and the allocated take of 250 l/s held by Smallburn Limited and subject to this application).

The sum of the consented primary allocation takes are greater than the 7-day MALF in all instances.

The proposed takes are assessed as primary allocation in accordance with Policy 6.4.2(b) and, as the application seeks to replace a consent which was granted prior to 28 February 1998 and the applicants have applied to replace this consent within the statutory timeframes given in Section 124 of the Act, the takes will retain primary allocation status.

7.1.2 Minimum Flows

Minimum flows may be set for a river or catchment for the purpose of restricting primary allocation takes of water. A minimum flow provides for the maintenance of aquatic ecosystem and natural character values of water bodies, while providing for the sustainable taking of water for use. Once set in Schedule 2A of the RPW, they are imposed on all relevant consents in that catchment. When a minimum flow is breached, all consents to take water as primary allocation (with some exceptions), must cease.

Policy 6.4.4 of the RPW states that in the case of existing resource consents to take water outside of Schedule 2A catchments, any proposed minimum flows must be set in Schedule 2A by a plan change, before it can be applied to any consent in accordance with Policy 6.4.5(d). No minimum flow has yet been set for any of these catchments. Any relevant consent within that catchment may be reviewed under Section 128 of the Act in order to impose conditions that will allow the minimum flow to be met.

It is noted that the relief sought by Aukaha is for a minimum flow to be set at 90% of MALF and for allocation to be the maximum of 30% of MALF or the total allocation from the catchment on the date that a national environmental standard comes into force less any resource consents surrendered, lapsed, cancelled or not replaced. It is noted that the proposed Land and Water Plan will be developed in accordance with the NPS-FM 2020, which will set limits and reduce overallocation and that until the planning framework has been updated allocation reduction and the imposition of minimum flows is not recommended.

7.1.3 Effects on Fish and Instream Values

With regard to the effects on the instream values of a surface water body, the following has been considered:

- the need for a residual flow at the point of take;
- the rate, volume, timing and frequency of water to be taken and used;
- the proposed methods of take;
- the need to prevent fish entering the intake;
- any effect on any Regionally Significant Wetland or on any regionally significant wetland value.

The application has been assessed by Ciaran Campbell, from the Council's Resource Science Unit who prepare the schematic at image 5 below to enable a clear understanding of the take regime. Mr Campbell's evidence is appended to this report.

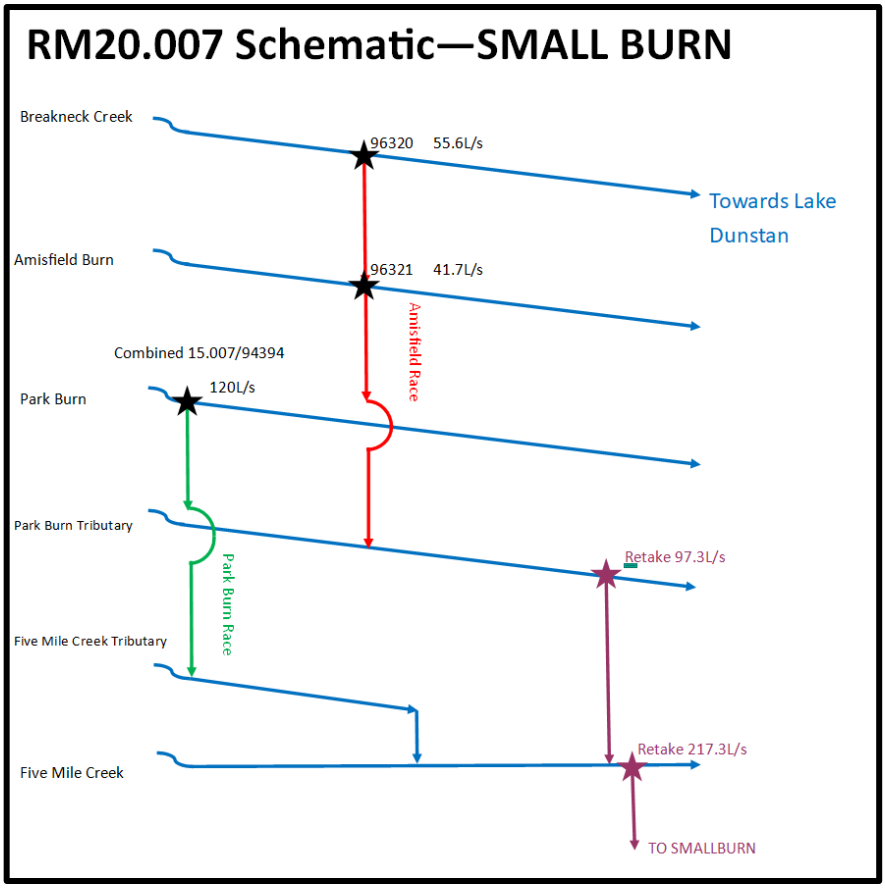

Image 5: Take regime as proposed by applicant (Source – Evidence of Ciaran Campbell)

In assessing the ecological values of the Amisfield Burn, Mr Campbell combined NZFFD records with the recent survey report provided in the consent application, and on-site observations. The NZFFD provides presence/absence data for fish species at 16 sites in the Amisfield Burn, Park Burn and Five Mile Creek catchments. Records exist for fish surveys from 1996, 2001, and 2018. There are three fish species recorded since 1996: brown trout (*Salmo trutta*), upland bully (*Gobiomorphus breviceps*) and kōaro (*Galaxias brevipinnis*). Since 2018, a survey was completed in the Amisfield Burn and Park Burn catchments by Dr Richard Allibone of Waterways Consultants Ltd. Brown trout were detected at seven sites and a single rainbow trout (*Oncorhynchus mykiss*) was detected at one site.

While sampling across the catchments is not extensive, Mr Campbell considers that there is sufficient data to determine fish values. He notes that brown trout and rainbow trout are introduced sports fishes that appear to have formed a self-supporting, stunted population in these catchments which are highly unlikely to be acting as a nursery to the downstream Lake Dunstan fishery due to the ephemeral nature of the waterways.

With regard to upland bullies, Mr Campbell notes that these prefer lower velocity areas and typically have life histories that do not include migration. There are scattered populations of upland bullies in the Lake Dunstan catchment. The limited distribution of upland bullies in the affected waterways, coupled with their preference for low water velocity reduces the need for residual flow considerations at the point of take in Mr Campbell's opinion.

Mr Campbell advises that kōaro are classified as At Risk and Declining with a qualifier of partial decline. Two adult kōaro have been recorded since 1996 in the waterways affected by the consent application. Mr Campbell notes that it is not unusual to observe an individual kōaro in streams in this region. However, Mr Campbell advises that this does not necessarily indicate that whitebait runs coming from Lake Dunstan occur. An overview of the very few NZFFD kōaro records nearby highlights their scarcity with three or fewer kōaro observed at each site.

Mr Campbell considers that it is not necessary to provide for residual flow considerations for kōaro given:

- Limited records of kōaro nearby; and
- Low abundances of kōaro where recorded nearby; and
- The potential negative impacts of kōaro on threatened species in nearby catchments.

Mr Campbell notes that there are no Regionally Significant Wetlands that will be affected, adversely or otherwise, by the proposed water takes and retakes.

When considering the hydrology – Breakneck Creek, Amisfield Burn, Park Burn, Five Mile Creek and tributaries, Mr Campbell notes that these waterways flow roughly parallel in an easterly direction from the upper Pisa Range, descending rapidly before flattening out as they reach the valley floor on their way towards Lake Dunstan.

Based on the data provided in the application and MALF statistics provided by ORC Hydrologist, waterways affected by this consent application are naturally ephemeral due to loss of surface water to ground in reaches on the valley floor. In Mr Campbell's opinion, residual flows below water takes should maintain flow connectivity through the point of take to allow invertebrates to drift downstream and move upstream. Mr Campbell notes that the following residual flows are proposed by the applicant;

- 10 l/s residual flow proposed for the Park Burn take
- the open channel diversions at current takes in Breakneck Creek (96320) and Amisfield Burn (96321) allow for roughly 50% of the flow to pass the intake, even during low flows.

Mr Campbell considers that this supports the considerations raised by the Department of Conservation in their advisory letter (dated 13 July 2020and appended to this report).

Mr Campbell notes that the Otago Regional Council does not have flow recorders in every waterway along the eastern side of the Pisa Range, however a flow recorder was installed in the Amisfield Burn in 2013. The Amisfield Burn flow recorder is not impacted by any water abstraction or augmentation, therefore the recorded flows can be considered natural. The flow data provided from this recorder was modelled by used by ORC Hydrologist Xiaofeng Lu with particular focus on a method for establishing residual flows on retakes.

In Mr Campbell's opinion, any residual flow downstream of retakes should ensure only retake water is taken and natural flows remain. DoC raised how best to ensure only retake water within Five Mile Creek and Park Burn tributary is taken and any natural flow remains To provide for that consideration, ORC hydrologist Xiaofeng Lu has calculated natural flows upstream of the retake points, which can be used to establish residual flows downstream of retakes.

Based on this assessment, Mr Campbell considers that during low flows, recharged waterways (Park Burn tributary and Five Mile Creek) appear to be so small that retake is likely to be capturing only augmented water. In addition to this, it is difficult to quantify flow statistics due to the small flow dataset across a short time period. Based on this, there is difficulty quantifying numerical residual flows downstream of retakes.

Mr Campbell considers that Five Mile Creek appears to be almost entirely augmented water at low flows and, as such, no residual flow is proposed for this retake. With regard to the retake on Park Burn tributary, a residual flow should maintain flow connectivity through the point of take to allow invertebrates to drift downstream and move upstream. Quantifying a numerical residual flow is difficult, therefore a visual residual flow immediately downstream of the Park Burn tributary retake is recommended.

Mr Campbell notes with regard to fish screens, the hydrological nature and connectivity of these catchments is complex and highly variable. To prevent unnecessary mortality, freshwater fishes should be able to move freely between natural waterways, water races, and storage ponds within the systems affected by this application. To further prevent unnecessary mortality, a fish screen should be installed on the outlet from the larger 120,000 m^3 storage pond. A drum-shaped screen with 3mm mesh is recommended

Overall, Mr Campbell recommends that an agreed water take structure/design be established which provides the agreed 50:50 flow sharing regime on the Amisfield Burn and Breakneck Creek and that residual flows are maintained on the Park Burn and Park Burn tributary retake. Monitoring of residual flows should be in the form of photographs on regular fortnightly basis with photo points set up.These photographs then should be forwarded on to the Consenting Authority.

Overall, the assessment by Mr Campbell is adopted for the purposes of this report and subject to the residual flows and fish screening, the ecological effects of the proposed take are no more than minor.

7.2 Natural Character and Amenity Values

The taking of water can influence flows of a river thereby altering its natural character as well as adversely affect the amenity values associated with it. As noted previously, the Amisfield Burn is identified in Schedule 1A as having an absence of aquatic pest plants and the presence of indigenous fish species threatened with extinction. Specifically, the Amisfield Burn is identified within the Schedule as "significant habitat for koaro." The Park Burn, Five Mile Creek and Breakneck Creek do not have any scheduled 1A values recorded.

It is noted that the applicant has consulted with the DoC and has consequently offered a condition which will require that:

> *The consent holder shall maintain a visual residual flow immediately downstream of the waterfall below the Amisfield Burn intake, at approximately NZTM 1300939E 5018657N.*

DOC has issued an advisory letter in respect of this application. The advisory letter has no legal standing and is not a submission. The matters raised in the letter support the offered condition, and makes suggestions regarding maintaining a residual flow downstream of Breakneck Creek and to ensure only delivered water is taken from Five Mile Creek and the unnamed tributary of the Park Burn and natural flow remains.

Mr Campbell assesses that the proposed residual flow in the form of a 50:50 flow sharing regime for the Amisfield Burn and Breakneck Creek, the 10 l/s for the Park Burn and a visual residual flow for the tributary of the Park Burn will provide for natural character and amenity values within the catchment. Mr Campbell's assessment is adopted for the purposes of this report and the effects of the proposal on natural character are no more than minor.

7.3 Cumulative Effects

In accordance with Section 3 of the Act, the definition of 'effect' includes *any cumulative effect which arises over time or in combination with other effects.* There is no definition for 'cumulative effect' under the Act, other than what is outlined above. The Oxford English dictionary defines 'cumulative' as meaning 'having a result that increases in strength or importance each time more of something is added' and 'including all the amounts that have been added previously'. Westlaw NZ expands on this definition by drawing from case law. The case law advises that a cumulative effect is an effect that will occur as opposed to a 'potential effect'. (*Dye v Auckland Regional Council* (2001) 7 ELRNZ 209 (CA)).

In respect of this application, it is noted that the Amisfield Burn, Breakneck Creek, Park Burn and Five Mile Creek are tributaries of the Clutha River /Mata-Au. The proposed takes are not expected to have a cumulative effect on the wider Clutha River Catchment. In respect of the cumulative effects on the Amisfield Burn and Park Burn catchments themselves, the proposed take is assessed as primary allocation and the take and use is well established. The proposal represents an overall reduction in the rate of take and annual volume when compared to that currently allocated. Furthermore, the subject watercourses are ephemeral in the lower reaches, regardless of abstraction. It is assessed that in respect of these takes there are no more than minor cumulative effects in relation to the abstraction of water from a pure volumetric point of view.

However, there is a need to take a ki uta ki tai approach to these applications and the applications need to be considered under the relevant provisions of the NPS-FM. Hearing all three of these applications at once should help to ensure that a ki uta ki tai approach is taken.

7.4 Effects on Other Water Users

There is one downstream user on the Amisfield Burn, one user at the same location on Breakneck Creek and two downstream users on the Park Burn as shown below:

Table 9: Other Water Users

Permit No.	Creek	Location	Rate of take (l/s)	Primary consent holder	Current application lodged with ORC
97232	Amisfield Burn	Approx. 2.4 km d/s of the 96321 take.	83.3	LLHLP	RM20.020
97358	Breakneck Creek	Approximately the same location as the 96320 take.	55.6	LLHLP	Identified as "not to be renewed" in RM20.020
98526	Park Burn	Approx. 2.5 km d/s of the RM15.007.01/ 94394 take.	27.8	Rockburn Wines Limited	RM20.003
93177	Park Burn	Approx. 1.3 km d/s of the RM15.007.01/ 94394 take.	55.6	Mark II	unexercised

All above parties were considered potentially affected by the proposal and notice of the application was served on them. A late submission was received from Mark II Limited. It is noted that in terms of the Amisfield Burn and Breakneck Creek, there is no proposed change to the existing take regime. In respect of the Park Burn, the allocation is currently 250 l/s and data records show that 150 l/s has regularly been taken. The applicant seeks to reduce this take further to 120 l/s. A residual flow is proposed to ensure that flow is retained in the Amisfield Burn, such that the wider effects on the above water users are assessed as no more than minor but not less than minor.

Mark II Limited advises that the status of Deemed Permit 93177 as outlined in the application does not, in its opinion, accurately reflect the legal status of Deemed Permit 93177 which the submitter states lapses on 1 October 2021. Council records show that this deemed permit will expire on this date It is noted that the replacement of Deemed Permit 93177 may still be subject to an application by Mark II Limited.

The ORC Water metering team made contact with Mark II Limited in March 2020 seeking confirmation that Deemed Permit 93177 was being exercised following an audit undertaken in February 2020. The audit noted that the point of take for 93177 was not located as per the consent and the points of take were at the same locations (NZTM E1302343 N50146700 and NZTM E1303319 N5016332) as Deemed Permit 98256 held by Rockburn Wines Limited. Mark II Limited advises that the point of take was relocated after the flooding and slip events in the 1999 period. The audit noted that suitable water metering is installed along with a datalogger and telemetry

unit, but that a WEX has not been granted for 93177. Data records for the combined takes are assessed as exceeding the current deemed permit limits when considering the combined 300,000 litres per hour authorised by both 98526 and 97133. Mark II Limited advises that, since the early 2000's, it has worked with Rockburn Wines and that water taken at the intake of 98526 up to 100,000 litre per hour (28 l/s) is assumed to be under 98526, and where the water take exceeds this, it has been considered to be water authorised under 93177, which authorised a take 200,000 l/h (56 l/s) from the Park Burn.

Given the supportive submission, which raises points of clarification rather than seeks conditions of consent or other outcomes, and the nature of the Park Burn at this location, it is considered that there are no effects on downstream water users arising from this proposal.

Overall, it is considered that reduction in authorised rate of take within the Park Burn from 250 l/s to 120 l/s along with the offered residual flow offered for the Amisfield Burn flow will ensure that effects on downstream water users are acceptable.

7.5 Groundwater Effects

The effects of the proposed take on groundwater has been assessed as Pattle Delamore Partners Limited (PDPL) (assessment is appended to this report). PDPL notes that closest designated aquifer is the Lowburn Alluvial Ribbon Aquifer (within the Low Burn surface water catchment) southwest of the Applicant's points of take in the Amisfield Burn and Park Burn catchments. Theoretically, based on the geometry of the applicant's irrigation areas and the interpreted hydrogeologic setting, the applicant's takes from the catchments to the northeast are introducing additional water resources (via irrigation losses to ground) to an area within the Low Burn surface water catchment in the vicinity of gullies that drain into the Lowburn Alluvial Ribbon Aquifer area. The proposed takes are interpreted to be potentially beneficial to the closest designated aquifer, from a groundwater quantity perspective.

PDPL notes that according to the ORC database, there is a potentially affected draft/recommended aquifer (Pisa Groundwater Management Zone) flanking the western side of Lake Dunstan about 0.5 km downstream of the Applicant's takes along the Amisfield Burn. Although this groundwater management zone extent mostly corresponds to the extent of the Late Pleistocene river deposits (gravelly alluvium between Lake Dunstan and SH6) and Holocene river deposits (gravelly alluvium extending up the valleys of the lower foothills to the bedrock base of the Pisa Range metamorphic rocks flanked by glacial till deposits). PDPL note that this zone appears to be primarily delineated based on the topography of the land surface where the foothills extending from the Pisa Range transition into the lower flatter areas on the western side of Lake Dunstan and up the lower valley fill areas of Five Mile Creek, Park Burn, and Amisfield Burn.

PDPL advise that bores in the area appear to be primarily concentrated towards Lake Dunstan within the extent of the alluvium between SH6 and the lake. The hydrogeologic setting is such that any surface water flow within the Amisfield Burn that is lost to groundwater above (upgradient) and outside of the Pisa Groundwater Management Zone is expected to arrive as groundwater inflow on the northwest side of the zone. Additionally, surface water flow losses within the Pisa Groundwater Management Zone above the point of inflow into Lake Dunstan are expected to bolster the groundwater supply. PDPL note that the Amisfield Burn and Park Burn surface water catchments are overallocated and that the Amisfield Burn and Park Burn are to naturally run dry due to losses to groundwater.

The applicant's three primary take locations related to the proposed replacement consents from the Amisfield Burn and Park Burn appear to be located within the upper reaches of the catchments with the Breakneck Creek take over the basement (schist) rocks and the Amisfield and Park Burn takes over the upper areas of recent gravelly river deposits. The Pisa Groundwater Management Zone is then further downstream, which has, according to ORC, 2,234,080 m^3/year of groundwater available for allocation. This volume of groundwater available for allocation is less than the applicant's proposed take of 2,297,463 m^3/year, indicating that, if this was treated as a groundwater take, there would not be sufficient water available for allocation in the proposed zone.

PDPL advises that mid-summer flow gaugings (with all surface water abstractions ceased 24 hours prior to the survey) on 15 January 2019 provided by the applicant demonstrates that the Amisfield Burn and Park Burn gain within their upper reaches in the vicinity of the three takes and then lose significantly to groundwater as they flow out of the hard rock (schist) Pisa Range over gravelly alluvium towards their points of discharge into Lake Dunstan. According to the flow gauging survey and field observations provided by the applicant, the Amisfield Burn and Park Burn in their natural settings will not always reach Lake Dunstan. PDPL agrees with these findings.

The flow gauging results show that the Amisfield Burn lost about a third of its flow (211 to 153 l/s) between the confluence with the Breakneck Creek (in the vicinity of the applicants take) and the downstream site (about 2 km downstream above SH6). The relative rate of loss to groundwater then increased where about half of the flow was lost over about 600 m between the site above and below SH6 (153 to 72 l/s). Over the final stretch of Amisfield Burn all the remaining 72 l/s was lost to groundwater over about 700 m before reaching Lake Dunstan. The applicant has noted the ORC flow monitoring on the upper reaches of the Amisfield Burn since 2013 indicating a mean annual flow of 162 l/s and a mean annual 7-day low flow of 65 l/s. Given the gauging survey and the ORC statistics on flow, PDPL consider it likely that the Amisfield Burn in its natural setting is generally lost to groundwater prior to reaching Lake Dunstan.

Depth to groundwater information available through ORC suggests that bores in the vicinity of SH6 and the Amisfield Burn and Park Burn are generally about 30 m deep with groundwater at about 20 m bgl. The Amisfield Burn, Breakneck Creek, and Park Burn in the vicinity of the Applicant's current/proposed takes represent a combination of hard rock aquifer, snowmelt, and precipitation contributions outside of the Pisa Groundwater Management Zone. It is expected that the existing/proposed takes reduce natural groundwater recharge to the proposed Pisa Groundwater Management Zone and could therefore potentially impact groundwater levels at supply wells and surface water bodies, the overall groundwater resource and reduce the potential for contaminant dilution.

PDPL understand that surface water inflows from the Amisfield Burn and Park Burn, and other streams flowing towards Lake Dunstan, are included in ORC's calculation of allocation status for the proposed Pisa Groundwater Management Zone. PDPL advises that ORC may therefore wish to consider accounting for the takes in the groundwater allocation block, in addition to surface water, to recognise the potential reduction in recharge. Given the magnitude of this take compared to the available allocation, the effects on the overall groundwater resource could be significant, however, as noted above, PDPL advise that this is not a new abstraction and the allocation limit is a proposed limit only.

The applicant advises that the closest groundwater take consents are over 4 km to the southeast of the takes and has stated that, based on the separation distance, that no adverse effects are

expected. PDPL has undertaken a review of bores on the ORC database which shows a domestic bore (G41/0202) about 3.5 km southeast of the applicant's Park Burn tributary take. The ORC database shows that the closest potentially affected bores are generally in the vicinity of SH6 flanking each side of the Amisfield Burn. These bores are around 30 m deep with relatively deep groundwater levels up to about 20 m bgl. The bores transition to have slightly shallower depths with shallower depth to groundwater observations toward Lake Dunstan in the vicinity of the Amisfield Burn. This is most notably demonstrated by bore G41/0346 (15 m deep with a 3.5 m depth to groundwater) adjacent to Lake Dunstan and the Amisfield Burn point of discharge into the lake.

Given that the Amisfield Burn and Park Burn are interpreted to only reach the lake on occasion during higher flow events (likely stormwater dominated flows) and that mounding effects associated with these flows in the relatively permeable alluvium would only be expected to be temporary (on the order of hours to days), it is unlikely that these bores rely on direct mounding effects specific to flows from these waterways. Constant head boundary effects from Lake Dunstan (with a likely direct hydraulic connection) as well as the other recharge to the overall groundwater resource within the Pisa Groundwater Management Zone, together with this being an existing abstraction, means that the levels in supply bores are unlikely to be adversely affected.

Given the assessment above, adverse effects on neighbouring bores due to lowered groundwater levels or reduced capacity for contaminant dilution are not expected to occur as a result of the proposed take from the Amisfield Burn and Park Burn.

Overall, PDPL consider that the taking of surface water is expected to reduce groundwater recharge. However, no residual flow specific to groundwater effects or specific groundwater conditions are considered necessary in this instance. PDPL's assessment is adopted for the purposes of this report and it is assessed that the effects of the take on ground water are acceptable.

7.6 Cultural Effects

The Park Burn, Amisfield Burn, Breakneck Creek and Five Mile Creek are all tributaries of Lake Dunstan/Te Wairere which is part of the Clutha River/Mata-Au catchment. The Clutha River/Mata-Au is a Statutory Acknowledgement area. Te Runanga O Ngai Tahu (TRONT) were sent advice of the application and Aukaha Limited on behalf of TRONT advised on 27 January 2020 that Kai Tahu ki Otago considered themselves to be an affected party, pursuant to Section 95E of the Resource Management Act 1991 to the application. The subsequent S95A-E decision confirmed this.

Aukaha Limited on behalf of Te Rūnanga o Moeraki, Kāti Huirapa Rūnaka ki Puketeraki, Te Rūnanga o Ōtākou and Hokonui Rūnanga (Nga Runanga) made a submission on the application. The submission sets out the takiwa of each runanga, detail of the Deed of Settlement under the The Ngāi Tahu Claims Settlement Act 1998 and the principles of the The Kāi Tahu ki Otago Natural Resource Management Plans 1995 and 2005. Kāi Tahu aspirations for freshwater management are recorded in the *Te Rūnanga o Ngāi Tahu Freshwater Policy Statement 1999,* and the *Kāi Tahu ki Otago National Resource Management Plan 2005.* Te Ao Marama Incorporated also made a submission on the application.

Kāi Tahu has a cultural, spiritual, historic and traditional relationship with the Clutha Catchments/Mata-au. Kāi Tahu ki Otago used all areas of the Clutha/Mata-au catchments as evidenced by the hundreds of mahika kai sites associated with the many waterways, lakes and

wetlands in the Clutha/Mata-au catchments. Many of these waterways have been modified or lost as a result of mismanagement and misappropriation of this taoka. All water plays a significant role in Kāi Tahu spiritual beliefs and cultural traditions, the condition of water is seen as a reflection of the health of Papatūānuku. The loss and degradation of this resource through drainage, pollution and damming is a significant issue for Kāi Tahu ki Otago and is considered to have resulted in material and cultural deprivation.

The primary management principle for Nga Runanga is the maintenance and enhancement of the mauri or life-giving essence of a resource. Mauri can be tangibly represented in terms of elements of the physical health of the land, a river, or surrounding biodiversity. There are also many intangible qualities associated with the spiritual presence of a resource, elements of physical health which Nga Runanga use to reflect the status of mauri and to identify the enhancements needed include:

- Aesthetic qualities e.g. natural character and indigenous flora and fauna;
- Life supporting capacity and ecosystem robustness; and
- Fitness for cultural usage

Nga Runanga consider that mismanagement and appropriation of water resources in Otago has resulted in most catchments being 'over-allocated', meaning that the volume of water abstracted through resource consents exceeds the volume of water available in the catchment. When considering abstractions, Nga Runanga understand that every take affects the mauri of the river system. Nga Runanga consider it is their right as rakatira, and our obligation as kaitiaki, to ensure that the mauri of the water comes first.

Kāi Tahu advises that it has unresolved customary interests in water, which it asserts must be taken into account in the consenting process and that water permits must not be treated as a property rights. As such, the adverse effects of the take should be avoided and mitigated by limiting the water extraction in both term and the nature of the take. Limiting the take and use of water is consistent with the RMA, and Kāi Tahu customary rights and interests.

Nga Runanga consider that the application will prevent the protection and restoration of mahika kai habitats in the Clutha/Mata-au Catchment. To manage the effects on cultural values, Nga Runanga consider that it is appropriate for a short-term consent to be granted in this instance to avoid locking in unsustainable water use which would inhibit the Council from effectively implementing the outcomes of its intended new RPS (Regional Policy Statement) and the future LWRP (Land and Water Regional Plan). Nga Runanga consider that granting of a long-term consent in this instance would be inconsistent with the RMA, the planning framework, Kāi Tahu tikaka, rakatirataka and the exercise of kaitiakitaka.

In respect to flow conditions, no environmental flows have been set on the Park Burn, Amisfield Burn or any of their tributaries and, as such, it is Nga Runanga's preference is to determine the appropriate allocation in accordance with the proposed National Environmental Standard for Ecological Flows and Water Levels 2008 (NES):

- A minimum flow of 90% of the mean annual low flow (MALF) as calculated by the regional council and an allocation limit of, whichever is greater of:
    - 30% of MALF as calculated by the Regional Council
    - the total allocation from the catchment on the date that the national environmental standard comes into force less any resource consents surrendered, lapsed, cancelled or not replaced.

The applicant has assessed the effects on cultural values by making an assessment against what they have assessed as the relevant iwi planning documents (Te Runanga o Ngai Tahu Freshwater Policy Statement and Kai Tahi ki Otago Natural Resource Management Plan). This assessment generally indicates that the application is in accordance with these plans, subject to fish passage requirements, fish screens and consent duration. The residual flows proposed will enhance the mauri of the water. Fish screens are not recommended by the applicant but it is suggested that these be imposed on the outlet from the storage pond, based on the advice of the ORC Freshwater Scientist and further discussed 7.1.3 above. It is considered that the fish screens will mitigate some of the effects on cultural values. The reasons for the consent duration recommended are discussed in section 10 of this report. It is noted here that this is a submission matter raised by Aukaha and TAMI. Overall, the cultural effects of the proposed abstraction are considered to be minor.

7.7 Water Use Assessment

Water use assessment considers what the applicants have applied for, their historic use and what is considered efficient. The applicants are proposing to take and use the water for irrigation and stock water supply.

7.6.1 Historical Water Access

To assist in the reduction of primary allocation under Policy 6.4.2(b), Policy 6.4.2A allows only water that has been historically accessed under previous consents to be considered to be granted as primary allocation (except in the case of a registered community drinking water supply where an allowance may be made for growth that is reasonably anticipated).

The Council is able to control the rate, volume, timing or frequency of take, or a combination of these. The Council could grant less water than has been taken under existing consents if it is satisfied on the evidence that the lesser quantity would:

(a) reflect only the water actually taken and the pattern of taking established under the existing consent; and/or
(b) minimise conflict between those taking water; and/or
(c) address the underutilisation of water allocated under the existing consent, including any underutilisation arising from;
  (i) inefficient and inappropriate practices; and/or
  (ii) consent holders retaining authorisation for more water than is actually required for the purpose of use.

The abstractions under 96320 and 96321 (combined) and 94394 and RM15.007.01 (combined) are metered. Meters are located down-race from the points of take (due to issues of communication, maintenance and other practicalities), and corresponding WEXs are held.

Sarah McCorie, the Council's Systems and Information Analyst has analysed the water data collected from WM0964 which measures abstraction under 96320.V1 and 96312.V1 from the Amisfield Burn (anaylsis appended to this report). Ms McCorie's analysis is appended to this report. Data was collected from 19 April 2013 to 10 June 2020 with a total of 57,308 hourly measurements recorded. The filtered data set contains 54,383 measurements with an average

take of 30.4 l/s, a median rate of take of 20.9 l/s, and a modal (most common) rate of take of 20.87 l/s.

The 80th, 90th, and 95th percentiles for the flow rate were calculated, without modelling the distribution, for the raw data set, the filtered data set, and the high rate data set. The results are presented to three significant figures below:

Table 10: Flow rate percentiles for Breakneck Creek/Amisfield Burn Take

	80th %ile	90th %ile	95th %ile
Raw rate	51.2	68.8	76.7
Filtered rate	52.8	69.6	77.3
High use rate	68	76.2	83.3

The analyst found that for the Amisfield Burn takes under 96320.V1 and 96312.V1:

- The seasonal pattern is consistent with irrigation.
- The pattern of taking indicates that water is also being taken for stock drinking water.
- The maximum volume taken in any day is 10,300 m^3
- The maximum volume taken in any month is 200,000 m^3.
- The maximum taken in any irrigation year is 1,269,900 m^3
- The applicant has applied for 97.3 l/s with a ±10% accuracy.
- The maximum average calculated in accordance with Method 10.A.4 is 115 l/s, which exceeds what the applicant has applied for.
- The lowest rate that can be taken and still in the range 97.3 l/s ±10% is 88.5 l/s which does not include any of the percentiles.

Analysis was also undertaken for the water data collected under WM0952 from 94394 and RM15.007.01 from the Park Burn. Ms McCorie's analysis is appended to this report. Data was collected between 19 April 2013 to 10 June 2020 with a total of 46,863 hourly measurements. Gaps in the data are identified from mid-2014 to the start of 2016 which appears to be due to a faulty data logger which has subsequently been replaced. Another gap at the end of 2018 is also attributed to a failure of the data logger which has subsequently been reset. The filtered data set contains 38,542 measurements with an average take of 43.2 l/s, a median rate of take of 41.3 l/s, and a modal (most common) rate of take of 0.01 l/s.

The 80th, 90th, and 95th percentiles for the flow rate were calculated, without modelling the distribution, for the raw data set, the filtered data set, and the high rate data set. The results are presented to three significant figures below:

Table 11: Flow rate percentiles on the Park Burn

	80th %ile	90th %ile	95th %ile
Raw rate	64	83.3	107
Filtered rate	69	88.2	114
High use rate	81.4	107	132

It is noted that water use has increased in the last data period Jan 2019 to Jan 2020 as shown below and this increased water take is not considered representative of the last five years of data.

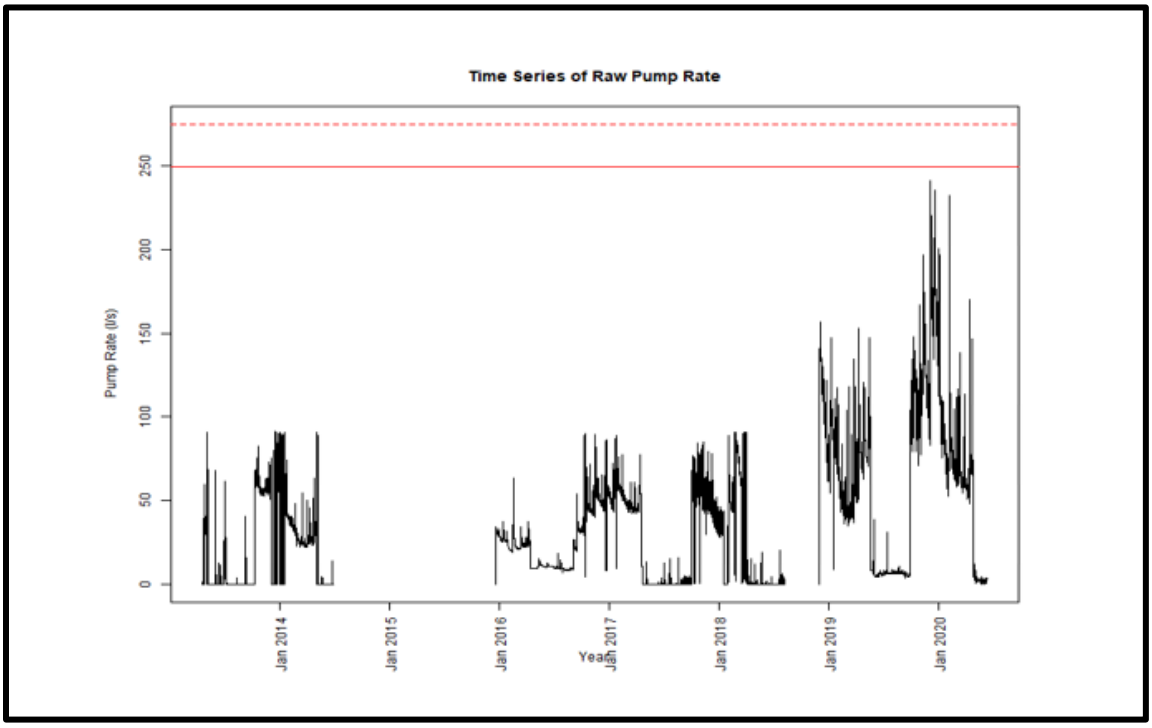

Image 6: Raw Pump rate data.

The analyst summarised that for the Park Burn takes under 94394 and RM15.007.01:

- The seasonal pattern is consistent with irrigation.
- The pattern of taking indicates that water is also being taken for stock drinking water.
- The maximum volume taken in any day is 17,700 m^3
- The maximum volume taken in any month is 419,000 m^3.
- The maximum taken in any irrigation year is 1,875,180 m^3
- The applicant has applied for 120 l/s with a ±10% accuracy.
- The lowest rate at which water can be taken and still be in the range 120 l/s ±10% is
- 108 l/s.
- Historic data indicates that actual average maximum water use for the period 1 July

- 2012 to 30 June 2017 is 83.9 l/s.
- The highest rate at which water can be taken and still be in the range 83.9 l/s ±10% is
- 92.3 l/s.
- These ranges do not overlap and are therefore they cannot be considered 'The Same'.

The Systems and Information Analyst assessment is adopted for the purposes of this report and based on the analysis above, it is considered that in respect of the historic pattern of use for the Amisfield Burn it has been established and is less than what is applied for.

In respect of the water takes from the Park Burn, there is a discrepancy between what is applied for (120 l/s) and the historic average maximum rate of water that has been taken (92.3 l/s). As such it is recommended that the water take be reduced to reflect the average maximum water take of 92.3l/s.

7.6.2 Efficiency of Water Take and Use

Policy 6.4.0A of the RPW requires that the quantity of water granted to take is no more than that required for the purpose of use taking into account the local climate, soil, crop or pasture type and the efficiency of the proposed water transport, storage and application system. The Council commissioned a report by Aqualinc Research Ltd (Aqualinc) entitled *"Water Requirements for Irrigation Throughout the Otago Region*", dated October 2006, to assess water volumes required to efficiently irrigate pasture and crops. This report was updated in July 2017.

Aqualinc developed a water-balance computer model that was used to estimate soil moisture levels over a 42-year period. This model takes into account the local climate, the types of soils, crop types and the irrigation system. The irrigation strategy meets a specific irrigation objective, being that production levels were to be maintained close to maximum for most of the time, and that even in the driest of conditions sufficient water would still be available to sustain plant growth.

The land area of the Otago region was divided into four main zones (Central and Lakes District, Coastal and South Otago, Maniototo and North Otago) based on geographical distribution and climatic conditions; primarily evapotranspiration and temperature.

These four zones are further divided into rainfall sub-zones using mean annual rainfall (MAR), as irrigation demand is primarily dependent on rainfall.

The soil type of an area and the rooting depth of a crop or pasture affect plant available water (PAW). PAW is the amount of water that a soil can store that is available for plants to use. Six soil PAW classes have been specified and soil data for each site can be obtained from the S-Map database (Landcare, 2014), the New Zealand Fundamental Soil Layer (NZFSL) (Landcare 2000) or a site-specific soil investigation.

This information is used to calculate the applicant's water requirement over monthly and seasonal periods. The monthly volume outlined in Aqualinc is the estimated peak monthly usage for any one month in an irrigation season but is not intended to be used for every month over the course of the season i.e. seasonal volume does not equal the monthly volume multiplied by the months in the irrigation season. Commonly, the peak monthly rate is used for one to two months in an irrigation season; however, this is dependent on variables such as rainfall, climate and crop growth.

A seasonal limit on the volume of water has been given to reflect that less water is required during the 'shoulder' of the irrigation season. Aqualinc provides recommended seasonal volumes based on an average year; a one and two-year drought (80th percentile); a one in ten-year drought (90th percentile); and a maximum situation. For Otago, it is considered that a one in ten-year drought or 90th percentile is the most appropriate when considering efficient water use.

As noted previously the applicant's water use includes:

- Centre pivot irrigation (approximately 187 ha currently and 36 ha proposed),
- K-Line irrigation (approximately 24 ha) and
- Flood irrigation (approximately 23 ha).
- Peak stocking units comprise approximately 7,000 sheep and 250 beef cattle with sheep stocking numbers to increase to 10,000 units.

The applicants have set out their efficiency of use calculations at Appendix D of the application. The efficiency of the various specific uses is discussed in further detail below.

7.6.2.1 Stock drinking water

The applicants have calculated stock drinking water requirements based on current and proposed stock numbers.

Table 12: Stock Drinking requirements

Stock units/water use	ORC guidelines (per Form 4)	Water required (l/day)
7,000 sheep (current)	5 l/head/day	35,000
3,000 sheep (proposed)	5 l/head/day	15,000
250 beef cattle	40 l/head/day	10,000
Total		60,000

The month allocation for stock water is 1,860m^3 and annually 21,900m^3. It is considered that the stock drinking water requirements calculated above are reasonable and are permitted activity pursuant to section 14 of the RMA. However, as this water also passes through the water meters, it is appropriate for this to be included within the overall allocation volume.

7.6.2.2 Baseflow

The applicants' scheme relies on gravity-fed races. Base flows prevent the race channel from drying out and cracking. It is expected that the constant stock water supply will act sufficiently as a base flow to protect the race. No additional water has been sought or is recommended for this purpose.

7.6.2.3 Irrigation

The applicants propose to increase the area of pasture to be irrigated from 284.4ha to 320.5ha. An assessment in respect of PPC7 and the increased irrigation area is made later in this report. It is noted that the overall water allocation is to reduce from that which is currently authorised. The irrigation soil types/uses and areas are as follows:

Table 13: Irrigation soil types/uses and areas

Soil Type	Area (ha)	MAR Zone	PAW	Mm/ha/day	m^3/day	m^3/Month	90%ile annual demand (m^3)	100%ile Annual demand (m^3)
Lowburn 2a.1	265.00	450	40	5.5	14,575	453,150	2,173,000	2,435,350
Molyneux 10A.1	8.60	450	40	5.5	473	14,706	70,520	79,034
Ranfurly 4a.1	9.10	450	120	4.2	382.2	11,830	64,974	76,440
Gees 1A.1	1.70	450	40	5.5	93.5	2,907	13,940	15,623
Lowburn 2a.1 (proposed)	36.10	450	40	5.5	1,985.5	61,7310	296,020	331,759
	320.5				17,509	544,324	2,618,454	2,938,206

Based on the soil type and crop, the applicant seeks a monthly volume of 544,324m^3 and annual volume of 2,938,206m^3. A daily volumetric limit is not being sought by the applicant.

In respect of the use of the 100 percentile Aqualinc calculation, if that approach was used as a precedent and applied region-wide in Otago it could result in locking up water that would rarely be used and that could not thereafter be allocated to other applicants. As such this is not an efficient use of a finite resource. In this case this is particularly relevant given the duration sought by the applicants. For example, a future review of the RPW could conceivably decrease the primary allocation or establish seasonal allocation limits. If the applicants are granted more water now than is the norm in many other regions, then that could well exclude other parties from accessing that water in future decades.

As such, it is recommended that the 90th percentile Aqualinc calculation be applied for the irrigation demand as follows:

- Monthly demand: 544,324 m^3
- Annual demand: 2,618,454 m^3

7.2.2.5 Summary of water use

The applicant is reliant on productive pastures for sheep and beef farming. When assessing the historic water use summarised by the system and information analysist, the following data is relevant:

Table 14: Rates of Take

Water body	Actual max average rate	Paper Allocation	Applied for rate	Recommended
Breakneck Creek/Amisfield Burn (96320.V1 and 96312.V1	115.0l/s	97.3l/s	97.3l/s	97.3l/s
Park Burn	92.3l/s	250l/s	120l/s	92.3l/s

94394 and RM15.007.01				
Total	198.9 l/s	347.3l/s	217.3l/s	189.6l/s

Table 15: Historic Maximum takes

Water body	Max m^3/day	Max m^3/month	Max m^3/year
Breakneck Creek/ Amisfield Burn	10,300	200,000	1,269,900
Park Burn	17,700	419,000	1,875,180
Total	28,000	619,000	3,145,080

The data analysis shows that the rate of take from the Park Burn has increased in the past 12-month monitoring period and is not considered reflective of the historic use overall. As such, it is recommended that the rate or take from the Park Burn be reduced to reflect the average maximum rate of take.

When considering the 90th percentile Aqualinc calculation for the irrigation and stock water demand, a monthly allocation of 546,184 m^3 and an annual allocation of 2,640,354 m^3 is considered an efficient use of the water resource.

The overall combined rate of take and the annual volumes applied for are less than what has been allocated historically and the area of land to be served by the water is increased. Furthermore, the monthly and annual allocation is reducing. As such, the application is assessed as being in accordance with Policy 6.4.2A, where no more water can be granted from within primary allocation than has been taken under the existing consent in at least the preceding five years.

7.3 Efficiency of Water Transport, Storage and Application System

The water takes are transported via open race. According to Irrigation New Zealand open channels can cause more trouble in operating an irrigation system than any other conveyance method if not designed and maintained correctly. The water races are unlined which causes losses due to seepage and have evaporation losses (up to 10%) and are therefore not the most efficient form of transport. The applicants have indicated that improvements to the water race infrastructure and maintenance regimes are proposed but no details of the any race improvements have been provided.

It is recommended that if the consent is granted that a consent condition is imposed that a scheme management plan be developed within 12 months of the grant of the consent that describes the measures that have been implemented and are proposed to be implemented to improve the efficiency of the of distribution, storage and application infrastructure. The condition also requires the applicant to outline a timeframe for improvements to be made and to review the plan every 5 years.

The application states that whilst the majority of the irrigation within the applicant's command area is spray, some areas of flood irrigation will remain. This is due to a range of factors, including location, topography, soil types and cost of conversion. However, the applicant continues to improve on-farm water use efficiency where it is feasible to do so, including the recent installation of a half pivot and the planned installation of another pivot towards the southern corner of the property.

The applicant has also taken steps towards more efficient storage of water with the construction of a new pond. The conveyance of water throughout the property is efficient with the installation of pipework where necessary. Continual maintenance of the water races will ensure that losses from these are not so significant.

7.4 Alternative Water Sources

The RPW promotes the management of water in a way that enables continued access to suitable water, ensuring communities can provide for their social, cultural and economic wellbeing, now and for the future. It achieves this by requiring consideration of whether the applied for source of water is the nearest practicable given the proposed location of use including whether the take and use of the water is an efficient use of the water resource, whether there is another practically available and accessible water source, and the wider benefits (economic, social, environmental and cultural) of taking from the water source applied for compared to taking water from other sources (Policy 6.4.0C).

The water is proposed to be used locally. There is high demand from water along the Pisa Range face. The existing abstractions are long-established and the conveyance and storage infrastructure is already in place. The applicant has invested significantly to ensure that the current infrastructure is maintained in working condition. The scheme already exists in a highly modified landscape that has developed around the reliable water supply. With the ability to use gravity systems, the scheme has a relatively low carbon/energy footprint compared to many other irrigation systems.

It is noted that Five Mile Creek and the Low Burn catchment are located closer to the irrigated area but that there is insufficient or no water available from these water sources. The application notes that there are alternative sources of water within the take area including the Clutha River/Mata-Au and groundwater. Both of these sources may provide viable irrigation and stock drinking water for the applicant, however both would require significant investment in order to establish a secure connection particularly in the case of any Clutha River water as this would need substantial surveying, easements and resource consent investment along with pump and conveyance infrastructure capable of moving large volumes of water over a long distance (~`3 km) and up a steep ascent (~170 m elevation gain).

Overall, it is considered that current scheme is the most practicable means of taking water for the applicant's property and can be conveyed to the irrigation areas by gravity without the need for pumping or other electrical requirements. The proposed source is the nearest practicable source given this information.

7.5 Water Take and Use Management

Water Management Groups are voluntary. They provide flexibility for two or more consent holders to cooperate in exercising their consents, but without the added formality associated with a water allocation committee. In this instance, there are two other water users on the Park Burn, one on Breakneck creek, none on Five Mile creek and two on the Amisfield Burn. Separate Water Management Groups are not considered necessary. That said, it is noted that RM20.003, RM20.005, RM20.007 and RM20.020 relate primarily to replacement applications for the Park Burn and Amisfield Burn and were prepared simultaneously and collaboratively, suggesting that there is a good deal of co-operation within water users within the Pisa Range catchment overall.

8. Section 104 Evaluation

Section 104 of the Act sets out the matters to be considered when assessing an application for a resource consent. These matters are subject to Part 2, the purpose and principles, which are set out in Sections 5 to 8 of the Act.

The remaining matters of Section 104 to be considered when assessing an application for a resource consent are:

(a) the actual and potential effects on the environment of allowing the activity;

(ab) any measure proposed or agreed to by the Applicants for the purpose of ensuring positive effects on the environment to offset or compensate for any adverse effects on the environment that will or may result from allowing the activity;

(b) any relevant provisions of a national environmental standard, other regulations, a national policy statement, the Regional Policy Statement (RPS), the Regional Plan: Water (RPW); and

(c) any other matter the Council considers relevant and reasonably necessary to determine the application.

8.1 S104(1)(a) – Actual and potential effects on the environment of allowing the activity

Section 104(1)(a) of the RMA requires the council to have regard to any actual and potential effects on the environment of allowing the activity. This includes both the positive and the adverse effects.

8.1.1 Positive effects

The proposal will have the following positive effects:

- Enabling the continued operation of world-class vineyards and cherry orchards which are considered to be key contributors to the local and regional economies
- The water take and much of the irrigation systems from this source are gravity fed and as such, energy consumption is kept to a minimum resulting in a more sustainable operation.
- Supporting the community by providing job opportunities, supporting local businesses through equipment and supply acquisition, and improving land value.
- Contributing to local tourism, particularly in the case of the vineyards.

8.1.2 Adverse effects

In considering the adverse effects, the Consent Authority:

- may disregard those effects where the plan permits an activity with that effect; and
- must disregard those effects on a person who has provided written approval.

The assessment and conclusion of the "permitted baseline" for the s95A adverse effects assessment are considered applicable to s104(2), and so are not repeated here.

The adverse effects are evaluated at Section 7 of this report and found to be no more than minor subject to conditions of consent.

Summary
Taking into consideration the positive environmental effects above and the assessment of adverse effects, actual and potential effects on the environment are considered to be no more than minor.

8.2 S104(1)(ab) – Offset or Compensation

The applicant has not proposed or agreed to any measures to offset or compensate for adverse effects that will or may result from allowing the activity.

8.3 S104(1)(b) Relevant Planning Documents

The relevant planning documents in respect of this application are:

- The National Environmental Standard for Sources of Human Drinking Water
- The National Policy Statement for Freshwater Management 2014 (amended 2017)
- The National Policy Statement for Freshwater Management 2020
- The National Policy Statement for Renewable Electricity Generation
- Resource Management (Measurement and Reporting of Water Takes) Regulations 2010
- The Operative Regional Policy Statement, Proposed Regional Policy Statement and Partially Operative Regional Policy Statement
- The Regional Plan: Water for Otago
- Proposed Plan Change 7 (Water Permits) (PPC7)

8.4 National Environmental Standard for Sources of Human Drinking Water

Regulations 7 and 8 of the National Environmental Standard for Sources of Human Drinking Water (NES) need to be considered when assessing water permits that have the potential to affect registered drinking water supplies that provide 501 or more people with drinking water for 60 or more calendar days each year.

There are no registered drinking supplies within the vicinity of the proposed takes.

8.5 National Policy Statement Freshwater Management 2014 (amended 2017) (NPSFM)

The National Policy Statement for Fresh Water Management 2014, revised 2017 ("NPS-FM") provides a National Objectives framework to assist regional councils and communities to more consistently and transparently plan for freshwater objectives. The NPS-FM also directs how regional councils are to manage freshwater through their planning documents, and in the consideration of resource consent applications.

The Council has decided to progressively implement the policies in the NPS-FM in accordance with Policy E1, as set out in its Progressive Implementation Programme. The Council's Progressive Implementation Programme provides that the Council will carry out a plan review to the RPW to implement the policies in the NPS-FM (including establishing freshwater management units, freshwater objectives, and attributes in accordance with Policy CA), to be notified by December 2023.

The objectives and policies in the NPS-FM are relevant when considering an application to replace a deemed permit.

Objective AA1 is to consider and recognise Te Mana o te Wai in the management of fresh water. Referring to the Environment Court's interim decision on the Southland Regional Water and Land Plan, I consider Te Mana o te Wai to mean the need to provide for the health of the waterways. In this case the issue of residual flows is most relevant to the health of the waterways. In section 7.1, I discussed the need to impose residual flows and have specifically considered the relief sought in the submission of Aukaha in respect of the retention of the 50% of the natural flow in the waterways. This approach has been recommended for the Amisfield Burn and Breakneck Creek takes. On the basis of the natural flow regimes and the values supported by Park Burn, I am of the opinion that the residual flows proposed are appropriate mitigation measures and that no residual flow is required for Five Mile Creek. While for the Park Burn and Five Mile Creek these do not retain 50% of the natural flow, having regard to the holistic wellbeing of these waterways, I do not consider the application to degrade this to an extent that is unacceptable.

The objectives and policies in the NPS-FM are relevant when considering an application to replace a deemed permit. Part B of the NPS-FM relates to water quantity.

Objective B1 seeks to safeguard the life supporting capacity, ecosystem processes and indigenous species. The ecological assessment has found that the effects of the proposed take to be no more than minor, subject to conditions of consent, and, is this regard the application is considered to be consistent with this objective.

Objective B2 is particularly important in the case of over-allocated catchments as allocation is not currently fully addressed in the RPW. Objective B2 seeks to "avoid any further over-allocation of fresh water and phase out existing over-allocation".[2] If a particular catchment is considered to be over allocated, and the Council was to grant a new permit for the same volume as authorised under the current deemed permit, the decision would not avoid further over allocation in line with Objective B2. The decision to grant a new permit with the same volume in circumstances were the catchment is currently over allocated would not phase out existing over allocation.

This proposal sees the rate of take remain static for the Amisfield Burn and Breakneck Creek takes but a reduction on paper for the Park Burn takes from 250l/s to 120l/s as applied for and 92.3l/s as recommended. Monthly and annual allocation will also reduce overall. The application is considered to be consistent with Objective B2.

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[2] *The NPSFM defines over-allocation as:*
the situation where the resource: a) has been allocated to users beyond a limit; or b) is being used to a point where a freshwater objective is no longer being met. This applies to both water quantity and quality.

Objective B3 seeks to improve and maximise the efficient allocation and use of water. The applicant seeks to reduce the amount of water taken overall but increase the irrigated area and stocking rate for the property. The application is assessed as consistent with this objective.

Objective B4 seeks to protect significant values of wetlands and outstanding freshwater bodies. The application is considered to be consistent with this objective.

With regard to Objective B5 which seeks *" to enable communities to provide for their economic well-being, including productive economic opportunities, in sustainably managing fresh water quantity, within limits."* It is considered that proposed water takes will enable the continued operation of the applicant's farming activities which are considered to contribute to the local and regional economies, while the supporting infrastructure provides for a low energy consumptive operation. The water use directly contributes to job opportunities, support of local businesses and land value improvements.

Policies B5 and B7, set out clear direction that decisions must not result in future overallocation. In this case, if the application are granted as recommended will not result in any future over allocation and represent reduced primary annual allocation from what is currently authorised under the existing permits.

Aukaha raised concerns with the current planning framework not giving effect to the NPS-FM. The notification of PPC7 is a step towards addressing this issue. While the provisions of PPC7 cannot be afforded full weight, the recommended consent term is consistent with PPC7 and is considered an appropriate response to the issue.

8.6 National Policy Statement Freshwater Management 2020

The National Policy Statement Freshwater Management 2020 replaces the National Policy Statement for Freshwater Management 2014 (as amended in 2017). It comes into force on 3 September 2020. It is a relevant consideration when making a decision on this application as a decision will be made after this date.

The NPS-FM 2020 strengthens the concept of Te Mana o te Wai. This is a concept that refers to the fundamental importance of water and recognises that protecting the health of freshwater protects the health and well-being of the wider environment. It protects the mauri of the wai. Te Mana o te Wai is about restoring and preserving the balance between the water, the wider environment, and the community.

The NPS-FM 2020 outlines that Te Mana o te Wai encompasses 6 principles relating to the roles of tangata whenua and other New Zealanders in the management of freshwater, and these principles inform the NPS-FM 2020 and its implementation. The 6 principles are:

(a) Mana whakahaere: the power, authority, and obligations of tangata whenua to make decisions that maintain, protect, and sustain the health and well-being of, and their relationship with, freshwater

(b) Kaitiakitanga: the obligation of tangata whenua to preserve, restore, enhance, and sustainably use freshwater for the benefit of present and future generations

(c) Manaakitanga: the process by which tangata whenua show respect, generosity, and care for freshwater and for others

(d) Governance: the responsibility of those with authority for making decisions about freshwater to do so in a way that prioritises the health and well-being of freshwater now and into the future

(e) Stewardship: the obligation of all New Zealanders to manage freshwater in a way that ensures it sustains present and future generations
(f) Care and respect: the responsibility of all New Zealanders to care for freshwater in providing for the health of the nation.

It is noted that all decisions in respect of the NPS-FM 2020 should be made based on the best and scientifically robust information available.

The objective of the NPS-FM 2020 is to ensure that natural and physical resources are managed in a way that prioritises: first, the health and well-being of water bodies and freshwater ecosystems second, the health needs of people (such as drinking water) and third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.

In this case, the proposals seek to maintain and improve the health and well-being of the water bodies and associated freshwater ecosystems by the provision of residual flows. There are no current demands to use the resource for the health needs of people and the takes provide for people and communities to provide for their economic development.

The relevant policies of the NPS-FM 2020 are detailed below and assessed:

Policy 1: Freshwater is managed in a way that gives effect to Te Mana o te Wai.
Policy 2: Tangata whenua are actively involved in freshwater management (including decision making processes), and Māori freshwater values are identified and provided for.
Policy 3: Freshwater is managed in an integrated way that considers the effects of the use and development of land on a whole-of-catchment basis, including the effects on receiving environments.
Policy 4: Freshwater is managed as part of New Zealand's integrated response to climate change. Policy 5: Freshwater is managed through a National Objectives Framework to ensure that the health and well-being of degraded water bodies and freshwater ecosystems is improved, and the health and well-being of all other water bodies and freshwater ecosystems is maintained and (if communities choose) improved.
Policy 6: There is no further loss of extent of natural inland wetlands, their values are protected, and their restoration is promoted.
Policy 7: The loss of river extent and values is avoided to the extent practicable.
Policy 8: The significant values of outstanding water bodies are protected.
Policy 9: The habitats of indigenous freshwater species are protected.
Policy 10: The habitat of trout and salmon is protected, insofar as this is consistent with Policy 9. Policy 11: Freshwater is allocated and used efficiently, all existing over-allocation is phased out, and future over-allocation is avoided.
Policy 12: The national target (as set out in Appendix 3) for water quality improvement is achieved. Policy 13: The condition of water bodies and freshwater ecosystems is systematically monitored over time, and action is taken where freshwater is degraded, and to reverse deteriorating trends. 10 National Policy Statement for Freshwater Management 2020
Policy 14: Information (including monitoring data) about the state of water bodies and freshwater ecosystems, and the challenges to their health and well-being, is regularly reported on and published.
Policy 15: Communities are enabled to provide for their social, economic, and cultural wellbeing in a way that is consistent with this National Policy Statement.

It is noted that in respect of Te Mana o te Wai the NPS-FM 2020 directs that every regional council must engage with communities and tangata whenua to determine how Te Mana o te Wai applies to water bodies and freshwater ecosystems in the region. It is noted that this has not yet occurred for the Otago Region. The NPS-FM outlines that regional councils must give effect to Te Mana o te Wai, and outlines what must be involved in giving effect to. It is noted that the majority of this will occur as Otago Regional Council goes through the national objectives framework (NOF) process. By way of summary, the NOF process requires regional councils to undertake the following steps: (a) identify FMUs in the region, (b) identify values for each FMU, (c) set environmental outcomes for each value and include them as objectives in regional plans, (d) identify attributes for each value and set baseline states for those attributes, (e) set target attribute states, environmental flows and levels, and other criteria to support the achievement of environmental outcomes, (f) set limits as rules and prepare action plans (as appropriate) to achieve environmental outcomes. The ORC has identified FMUs in the region and this take is part of the Clutha River/Mata-Au FMU and Dunstan rohe. The Council is in the early stages of identifying the values for this FMU and rohe. Council will undertake the remaining steps in the NOF process in upcoming years and plans to notify the Land and Water Plan in accordance with the NPS-FM 2020 in late 2023. This will outline the limits that apply to these catchments. These will be considered when this replacement permit is replaced or via the review conditions that are recommended to be imposed.

In respect of Policy 3, ki uta ki tai is a relevant concept and requires that local authorities must: recognise the interconnectedness of the whole environment, from the mountains and lakes, down the rivers to hāpua (lagoons), wahapū (estuaries) and to the sea; and recognise interactions between freshwater, land, water bodies, ecosystems, and receiving environments; and manage freshwater, and land use and development, in catchments in an integrated and sustainable way to avoid, remedy, or mitigate adverse effects, including cumulative effects, on the health and well-being of water bodies, freshwater ecosystems, and receiving environments; and also encourage the co-ordination and sequencing of regional or urban growth. Consideration of the effects the takes have on the adjacent groundwater system and the Clutha River/Mata-Au itself has been given and recommended conditions, if consent were to be granted, require water use to be efficient, which should minimise associated water quality effects in the wider catchment. Implementation of Plan Change 8 to the RPW and the NES for Freshwater will also manage interrelated effects from the activity.

In respect of the other policies, it considered that tangata whenua have been involved in the consent process by being considered an affected party and the Maori values have been identified within their submission. Not all of the relief within their submission has been provided for notably in respect of minimum flows and allocation volumes and these will be established as part of a new Land and Water Plan. The reasons for the consent term sought are discussed later in section 10 of this report (Policy 2). The proposal will not result in the loss of natural inland wetlands nor is there any information to suggest that natural inland wetlands will be adversely affected by the activities (Policy 6). The takes will maintain or improve river values (the residual flows proposed for the Park Burn will improve and maintain habitat availability for invertebrates) (Policy 7). No significant outstanding water bodies will be affected (Policy 8). The activities as proposed will not affect the habitats of indigenous freshwater fish species including koaro and the habitat of trout is protected, given the nature of current trout habitat and mitigation proposed (Policy 8 and 9). Future overallocation is avoided and water will be used efficiently in accordance with best practice (Policy 11).

It is noted that in terms of water allocation the NPS-FM 2020 directs that every regional council must make or change its regional plan(s) to include criteria for deciding applications to approve transfers of water take permits; and deciding how to improve and maximise the efficient allocation of water (which includes economic, technical, and dynamic efficiency). Further every regional council must include methods in its regional plan(s) to encourage the efficient use of water. It is recognised that these policies and methods will be developed as part of the Land and Water Plan. These applications have been assessed in accordance with the existing objectives and policies and efficiency of water use has been considered. Recommended conditions, if the consents were to be granted, require ongoing improvement to the efficiency of water distribution and use during the consent term.

Overall, it is considered that the application is in general accordance with the NPS-FM 2020 insofar as the objective and policies can be considered at this point.

8.7 National Policy Statement on Renewable Electricity Generation

The National Policy Statement on Renewable Electricity Generation (NPSREG) came into effect on 13 May 2011 and has the objective of recognising the national significance of renewable electricity generation activities by providing for the development, operation, maintenance and upgrading of new and existing renewable electricity generation activities. Breakneck Creek, Amisfield Burn and Park Burn are tributaries of Lake Dunstan which is dammed by Contact Energy for renewable electricity generation. The most relevant policies to this proposed take are:

- Policy A which relates to recognising the benefits of renewable electricity generation activities including maintaining electricity generation; and
- Policy B which relates to the practical implications of achieving New Zealand's target for electricity generation from renewable resources and requires decision makers to have regard to even minor reductions in the generation output of existing renewable generation activities.

No adverse effect on renewable electricity generation has been identified and the proposal is considered to be consistent with the NPSREG.

8.8 Resource Management (Measurement and Reporting of Water Takes) Regulations 2010

Accurate, complete and current water information is a critical building block in establishing a water management system in which water is effectively allocated and efficiently used.

The regulations apply to holders of water permits (resource consents) which allow fresh water to be taken at a rate of 5 litres/second or more, specifically:

- Regulation 8 - Permit holder must provide records and evidence to regional council

The applicants currently monitor the water takes and uses both data logger and telemetry. The applicant has proposed that consent conditions to ensure they are consistent with the Resource Management (Measurement and Reporting of Water Takes) Regulations 2010 are placed on the consent.

The Resource Management (Measurement and Reporting of Water Takes) Regulations 2010 are to be amended by the Resource Management (Measurement and Reporting of Water Takes) Amendment Regulations 2020, which come into force on 3 September 2020. These regulations

introduce a staged timeline requiring holders of consents for more than 20 litres per second to measure their water use every 15 minutes, store their records, and electronically submit their records to the Council every day.

These daily reporting requirements do not come into force until 3 September 2022 for water takes of more than 20 litres per second. These regulations are also required to be complied with by consent holders regardless of whether they are included in a consent condition. It is noted that the recommended consent conditions, should the Commissioner be of mind to grant, are in accordance with the Resource Management (Measurement and Reporting of Water Takes) Amendment Regulations 2020 requirements with telemetry being proposed.

8.9 Regional Policy Statement, Proposed Regional Policy Statement and Partially Operative Regional Policy Statement

The Regional Policy Statement for Otago (RPS) provides an overview of Otago's resource management issues, and ways of achieving integrated management of natural and physical resources. The provisions of Chapter 6 (Water) are relevant to this application. The taking of water is consistent with the policies of the RPS, provided that it is done in a conservative manner that does not adversely affect instream biota, natural character, or other lawful water users. It is noted that the RPW gives full effect to the provisions of the RPS, therefore given the applications are consistent with the provisions of the RPW, it is also consistent with the RPS.

The proposed Regional Policy Statement (pRPS) was notified on 23 May 2015 and a decision was released 1 October 2016. Significant weight can be given to the pRPS as it is substantially through the statutory process. The pRPS was made partially operative on the 14th of January 2019 (PO-RPS), with the exception of all provisions and explanatory material in Chapter 3: Otago has high quality natural resources and ecosystems. The provisions that are the subject of court proceedings and are not made operative are shaded in grey below. Full consideration is given to the operative provisions of the PORPS. Weighted consideration is given to the provisions that have not been made operative in conjunction with the remaining operative provisions of the RPS, outlined above.

The relevant provisions of the pRPS/PORPS include:

The relevant provisions of the pRPS/PORPS include:

- *Provide for the economic wellbeing of Otago's people and communities by enabling the resilient and sustainable use and development of natural and physical resources (Policy 1.1.1)*
- *Provide for social and cultural wellbeing and health and safety by recognising and providing for Kāi Tahu values; taking into account the values of other cultures; taking into account the diverse needs of Otago's people and communities; avoiding significant adverse effects of activities on human health; promoting community resilience and the need to secure resources for the reasonable needs for human wellbeing; promoting good quality and accessible infrastructure and public services (Policy 1.1.2)*
- *Achieve integrated management of Otago's natural and physical resources (Policy 1.2.1)*
- *Taking the principles of Te Tiriti o Waitangi into account including by involving Kāi Tahu in resource management processes implementation, having particular regard to the exercise of kaitiakitaka and taking into account iwi management plans (Policy 2.1.2)*
- *Managing the natural environment to support Kāi Tahu wellbeing (Policy 2.2.1)*
- *Recognise and provide for the protection of sites of cultural significance to Kāi Tahu including the values that contribute to the site being significant (Policy 2.2.2)*

- *Enable Kāi Tahu relationships with wāhi tupuna by recognising that relationships between sites of cultural significance are an important element of wāhi tupuna and recognising and using traditional place names (Policy 2.2.3)*
- *Enable sustainable use of Māori land (Policy 2.2.4)*
- *Managing for freshwater values including*
    - *Maintain or enhance ecosystem health in all Otago aquifers, and rivers, lakes, wetlands, and their margins*
    - *Maintain or enhance the range and extent of habitats provided by fresh water, including the habitat of trout and salmon*
    - *Recognise and provide for the migratory patterns of freshwater species, unless detrimental to indigenous biological diversity*
    - *Avoid aquifer compaction and seawater intrusion in aquifers*
    - *Maintain good water quality, including in the coastal marine area, or enhance it where it has been degraded*
    - *Maintain or enhance coastal values*
    - *Maintain or enhance the natural functioning of rivers, lakes, and wetlands, their riparian margins, and aquifers*
    - *Maintain or enhance the quality and reliability of existing drinking and stock water supplies*
    - *Recognise and provide for important recreation values*
    - *Maintain or enhance the amenity and landscape values of rivers, lakes, and wetlands*
    - *Control the adverse effects of pest species, prevent their introduction and reduce their spread*
    - *Avoid, remedy or mitigate the adverse effects of natural hazards, including flooding and erosion*
    - *Avoid, remedy, or mitigate adverse effects on existing infrastructure that is reliant on fresh water (Policy 3.1.1)*
- *Ensure the efficient allocation and use of water (Policy 3.1.3)*
- *Manage for water shortage by*
    - *Encouraging collective coordination and rationing of the take and use of water when river flows or aquifer levels are lowering, to avoid breaching any minimum flow or aquifer level restriction*
    - *Encouraging water harvesting and storage, to reduce demand on water bodies during periods of low flows (Policy 3.1.4)*
- *Identify and protect outstanding freshwater bodies (Policy 3.2.13 & 3.2.14)*
- *Identify and protect the significant values of wetlands (Policy 3.2.15 & 3.2.16)*
- *Apply an adaptive management approach, to avoid, remedy or mitigate actual and potential adverse effects that might arise and that can be remedied before they become irreversible (Policy 5.4.2)*
- *Apply a precautionary approach to activities where adverse effects may be uncertain, not able to be determined, or poorly understood but are potentially significant (Policy 4.4.3)*
- *Consider the offsetting of indigenous biological diversity, when:*
    - *Adverse effects of activities cannot be avoided, remedied or mitigated;*
    - *The offset achieves no net loss and preferably a net gain in indigenous biological diversity;*
    - *The offset ensures there is no loss of rare or vulnerable species;*
    - *The offset is undertaken close to the location of development, where this will result in the best ecological outcome;*
    - *The offset is applied so that the ecological values being achieved are the same or similar to those being lost;*
    - *The positive ecological outcomes of the offset last at least as long as the impact of the activity*

The continued use of water will enable the applicant to continue to irrigate their land, resulting in their own economic wellbeing. Cultural and Kai Tahu values have been considered and Aukaha and TAMI on behalf of the local Runanga were considered affected in accordance with Section 95E of the Act. Freshwater values have been considered in this report, and the proposal will maintain or enhance these. Imposing the residual flows as discussed at Section 7.1 of this report will maintain and enhance natural character and aquatic values. The volumes sought have been compared with the Aqualinc recommendations and are considered an efficient use of water. The annual volume of water sought also does not exceed what has historically been taken, and the proposed reduction in the primary allocation in the catchment is considered a positive environmental change.

For the above reasons the applications are considered consistent with the provisions of both the RPS and PO-RPS.

8.10 Regional Plan: Water for Otago

The RPW was notified in 28 February 1998 and became operative in 1 January 2004. It is noted here, that the RPW was drafted before the NPS-FM 2014 (amended 2017) was notified and has not been updated to give effect to the NPS-FM. Council notified its Progressive Implementation Programme in December 2018 and has a plan to implement the NPS-FM. Part of this plan and as directed by the Minister for the Environment is that a plan change to the Water Plan was notified in March 2020. Issues with the Planning framework have also been raised in Environment Court cases, including the 'Lindis' decision by Judge Jackson *(Lindis Catchment Group Incorporated Vs Otago Regional Council ENV-2016-CHC-61*) on a plan change to the Water Plan specific to the Lindis catchment and a series of consents to take water to replace deemed permits.

Regional Plan Water (Operative)

Resource consent is required under the RPW for the proposal as follows:

Restricted Discretionary Activity Rule 12.1.4.5

Taking and use of surface water as primary allocation applied for prior to 28 February 1998 in catchments not listed in Schedule 2A:

(i) This rule applies to the taking of surface water, as primary allocation, in catchment areas not listed in Schedule 2A, if the taking was the subject of a resource consent or other authority:

(a) Granted before 28 February 1998; or
(b) Granted after 28 February 1998, but was applied for prior to 28 February 1998; or
(c) Granted to replace a resource consent or authority of the kind referred to in paragraph (a) or (b).

(ii) Unless covered by Rule 12.1.1A.1, the taking and use of surface water to which this rule applies is a restricted discretionary activity. The matters to which the Otago Regional Council has restricted the exercise of its discretion are set out in Rule 12.1.4.8.

(iii) Unless covered by Rule 12.1.1A.1, the taking and use of surface water in the Waitaki catchment to which this rule applies is a restricted discretionary activity provided that by itself or in combination with any other take, use, dam, or diversions, the sum of the annual volumes authorised by resource consent, does not exceed the allocation to activities set

out in Table 12.1.4.2. The matters to which the Otago Regional Council has restricted the exercise of its discretion are set out in Rule 12.1.4.8.

(iv) Takes to which this rule applies will not be subject to a minimum flow condition until the minimum flow has been determined by investigation and added to Schedule 2A by a plan change.

Note: If a minimum flow has been determined for a catchment previously not listed in Schedule 2A, and that minimum flow has been set by a plan change, the catchment will then be listed in Schedule 2A and Rule 12.1.4.2 or Rule 12.1.4.4 will apply.

Rule 12.1.4.8 Restricted Discretionary Activity considerations

In considering any resource consent for the taking and use of water in terms of Rules 12.1.4.2 to 12.1.4.7 and 12.2.3.1A, the Otago Regional Council will restrict the exercise of its discretion to the following:

(i) The primary and supplementary allocation limits for the catchment; and

(ii) Whether the proposed take is primary or supplementary allocation for the catchment; and

(iii) The rate, volume, timing and frequency of water to be taken and used; and

(iv) The proposed methods of take, delivery and application of the water taken; and

(iv) The source of water available to be taken; and

(vi) The location of the use of the water, when it will be taken out of a local catchment; and

(vii) Competing lawful local demand for that water; and

(viii) The minimum flow to be applied to the take of water, if consent is granted; and

(ix) Where the minimum flow is to be measured, if consent is granted; and

(x) The consent being exercised or suspended in accordance with any Council approved rationing regime; and

(xi) Any need for a residual flow at the point of take; and

(xii) Any need to prevent fish entering the intake and to locate new points of take to avoid adverse effects on fish spawning sites; and

(xiii) Any effect on any Regionally Significant Wetland or on any regionally significant wetland value; and

(xiv) Any financial contribution for regionally significant wetland values or Regionally Significant Wetlands that are adversely affected; and

(xv) Any actual or potential effects on any groundwater body; and

(xvi) Any adverse effect on any lawful take of water, if consent is granted, including potential bore interference; and

(xvii) Whether the taking of water under a water permit should be restricted to allow the exercise of another water permit; and

(xviii) Any arrangement for cooperation with other takers or users; and

(xix) Any water storage facility available for the water taken, and its capacity; and

(xx) The duration of the resource consent; and

(xxi) The information, monitoring and metering requirements; and

(xxii) Any bond; and

(xxiii) The review of conditions of the resource consent; and

(xxiv) For resource consents in the Waitaki catchment the matters in (i) to (xxiii) above, as well as matters in Policies 6.6A.1 to 6.6A.6.

As the original permits were granted prior to 28 February 1998 and the applicant has applied more than 6 months prior to the consent expiring, the water take retains primary allocation status in accordance with Policy 6.4.2.

The applicant is seeking resource consent for the re-taking of water from a tributary of the Park Burn and Five Mile Creek. These activities are assessed under Rule 12.1.4.1 of the RPW:

> *Rule 12.1.4.1*
> *Except as provided for by Rule 12.1.2.3, the taking and use of surface water from any lake or river which has already been delivered to that lake or river for the purpose of this subsequent taking is a* ***restricted discretionary*** *activity.*

Overall, the application is considered to be a **restricted discretionary** activity. All other relevant permitted activity rules set out in the operative plan are complied with.

Relevant objectives and policies from the RPW are considered below:

Objective 5.3.1	*To maintain or enhance the natural and human use values, identified in Schedules 1A, 1B and 1C that are supported by Otago's lakes and rivers.*
Objective 5.3.2	*To maintain or enhance the spiritual and cultural beliefs, values and uses of significance to Kai Tahu, identified in Schedule 1D, as these relate to Otago's lakes and rivers.*

The application has less than minor effect on the values listed in Schedules 1A, 1B, 1C and 1D of the RPW and detailed in section 5.3 of this report. The application is therefore consistent with these objectives.

Objective 5.3.3	*To protect the natural character of Otago's lakes and rivers and their margins from inappropriate subdivision, use or development.*
Objective 5.3.4	*To maintain or enhance the amenity values associated with Otago's lakes and rivers and their margins.*

The location of the point of take is on private property or have easements, is not considered to be an inappropriate use of the Amisfield Burn, Breakneck Creek, Park Burn or Five Mile Creek. As assessed at Section 7.1, the proposed takes will have less than minor effect on the natural character and amenity values. It is therefore considered that the application is consistent with these objectives.

Objective 5.3.6 *To provide for the sustainable use and development of Otago's water bodies, and the beds and margins of Otago's lakes and rivers.*

The applicants are proposing to increase amount of land irrigated with less water than is currently allocated. The irrigation methods are considered to be efficient, except for a small portion of flood irrigated land. The continued use of flood irrigation is due to a range of factors, including location, topography, soil types and cost of conversion. However, the applicant continues to improve on-farm water use efficiency where it is feasible to do so, including the recent installation of a half pivot and the planned installation of another pivot towards the southern corner of the property. Storage ponds ensure that water is managed efficiently. It is considered that the application offers a more sustainable use of the water resource and the proposed use of the water is consistent with this objective.

Policy 5.4.2 *In the management of any activity involving surface water, groundwater or the bed or margin of any lake or river, to give priority to avoiding, in preference to remedying or mitigating:*

(1) Adverse effects on:
- *(a) Natural values identified in Schedule 1A;*
- *(b) Water supply values identified in Schedule 1B;*
- *(c) Registered historic places identified in Schedule 1C, or archaeological sites in, on, under or over the bed or margin of a lake or river;*
- *(d) Spiritual and cultural beliefs, values and uses of significance to Kai Tahu identified in Schedule 1D;*
- *(e) The natural character of any lake or river, or its margins;*
- *(f) Amenity values supported by any water body; and*

(2) Causing or exacerbating flooding, erosion, land instability, sedimentation or property damage.

Policy 5.4.3 *In the management of any activity involving surface water, groundwater or the bed or margin of any lake or river, to give priority to avoiding adverse effects on:*
- *(a) Existing lawful uses; and*
- *(b) Existing lawful priorities for the use, of lakes and rivers and their margins.*

Policy 5.4.4 *To recognise Kai Tahu's interests in Otago's lakes and rivers by promoting opportunities for their involvement in resource consent processing.*

Policy 5.4.8 *To have particular regard to the following features of lakes and rivers, and their margins, when considering adverse effects on their natural character:*
- *(a) The topography, including the setting and bed form of the lake or river;*
- *(b) The natural flow characteristics of the river;*
- *(c) The natural water level of the lake and its fluctuation;*
- *(d) The natural water colour and clarity in the lake or river;*
- *(e) The ecology of the lake or river and its margins; and*
- *(f) The extent of use or development within the catchment, including the extent to which that use and development has influenced matters (a) to (e) above.*

Policy 5.4.9 *To have particular regard to the following qualities or characteristics of lakes and rivers, and their margins, when considering adverse effects on amenity values:*
- *(a) Aesthetic values associated with the lake or river; and*
- *(b) Recreational opportunities provided by the lake or river, or its margins.*

The proposed activity will have a no more than minor effect on the values listed in Schedule 1A. The natural character of the subject water bodies is assessed by ORC RSU and is considered to be maintained by the residual flows offered. DoC were served notice of the application but did not submit. However, DoC offered an advisory letter and after consultation with DoC the applicant offered a condition regarding a residual flow for the Amisfield Burn. The effects on Kai Tahu values are explained by Aukaha Limited and Te Ao Marama Incorporated in their submission. The downstream water users were assessed as affected parties. Due to the nature of the location of the takes, the effect on amenity, aesthetic, recreational or heritage values is assessed as acceptable and in accordance with the above policies.

Objective 6.3.1 *To retain flows in rivers sufficient to maintain their life-supporting capacity for aquatic ecosystems, and their natural character.*

Objective 6.3.2 *To provide for the water needs of Otago's primary and secondary industries, and community domestic water supplies.*

Policy 6.4.0A *To ensure that the quantity of water granted to take is no more than that required for the purpose of use taking into account:*

(a) How local climate, soil, crop or pasture type and water availability affect the quantity of water required; and

(b) The efficiency of the proposed water transport, storage and application system.

The applicants are proposing to take no more water than required for the purpose of the uses specified in their application, and the use of the water has been assessed as efficient taking local climate, soil, pasture type and water availability into consideration. A residual flow has been offered by the applicant for the Amisfield Burn and Breakneck Creek and the Park Burn. A further residual flow is recommended for the tributary of the Park Burn. It is considered that this residual flow is sufficient to maintain the life-supporting capacity for aquatic ecosystems and their natural character. The water is to be used for the needs of Otago's primary industries. The recommended rate of take has been reduced from that applied for to reflect historic use. Therefore, the proposed takes are assessed as consistent with these objectives and this policy.

Policy 6.4.2A *Where an application is received to take water and Policy 6.4.2(b) applies to the catchment, to grant from within primary allocation no more water than has been taken under the existing consent in at least the preceding five years, except in the case of a registered community drinking water supply where an allowance may be made for growth that is reasonably anticipated.*

Subject to the recommendations above, the proposed takes will result in a reduced rate of take and less water than has been taken as an annual volume under the relevant existing consent in the previous five years. Therefore, the proposal is consistent with Policy 6.4.2A

Objective 6.3.3 *To minimise conflict among those taking water.*

Policy 6.4.12 *To promote, establish and support appropriate water allocation committees to assist in the management of water rationing and monitoring during periods of water shortage.*

Policy 6.4.12A *To promote, approve and support water management groups to assist the Council in the management of water by the exercise of at least one of the following functions:*

(a) Coordinating the take and use of water authorised by resource consent; or

(b) Rationing the take and use of water to comply with relevant regulatory requirements; or

(c) Recording and reporting information to the Council on the exercise of resource consents as required by consent conditions and other regulatory requirements, including matters requiring enforcement.

Policy 6.4.12B *To manage water rationing amongst water takes, Council may either*

(a) Support establishment of a water management group; or

(b) Establish a water allocation committee.

Council may also instigate its own water rationing regime or issue a water shortage direction.

Policy 6.4.12C *Where appropriate, to include in water permits to take water a condition that consent holders comply with any Council approved rationing regime.*

Policy 6.4.13 *To restrict the taking of water in accordance with any Council approved rationing regime.*

Policy 6.6.0 *To promote and support development of shared water infrastructure.*

Policy 6.4.0B *To promote shared use and management of water that:*

(a) Allows water users the flexibility to work together, with their own supply arrangements; and

(b) Utilises shared water infrastructure which is fit for its purpose.

The applicant is encouraged to work collaboratively with the other water users within the Amisfield Burn and Park Burn Catchments but a formal water management group is not considered necessary. There is currently an arrangement between the applicant and LLHLP to share Breakneck Creek/Amisfield Burn water. Overall, it is considered that the application is consistent with the objective and policies listed above.

Policy 6.4.0C *To promote and give preference, as between alternative sources, to the take and use of water from the nearest practicable source.*

The applicants have investigated alternative water sources and the proposed water take is to be taken from the nearest practicable source and used locally. Therefore, the application is consistent with Policy 6.4.0C.

Policy 6.4.1 To enable the taking of surface water, by:

(a) Defined allocation quantities; and

(b) Provision for water body levels and flows,

except when

(i) the taking is from Lakes Dunstan, Hawea, Roxburgh, Wanaka or Wakatipu, or the main stem of the Clutha/Mata-Au or Kawarau Rivers.

(ii) All of the surface water or connected groundwater taken is immediately returned to the source water body.

(iii) Water is being taken which has been delivered to the source water body for the purpose of that subsequent take.

This application to take surface water has primary allocation status, is not subject to a minimum flow and the applicants have proposed a residual flow for the Amisfield Burn. Therefore, the application is considered to be consistent with this policy.

Policy 6.4.4 *For existing takes outside Schedule 2A catchments, minimum flows, for the purpose of restricting primary allocation takes of water, will be determined after investigations have established the appropriate minimum flows in accordance with Method 15.9.1.3. The new minimum flows will be added to Schedule 2A by a plan change and subsequently will be applied to existing takes in accordance with Policy 6.4.5(d). For new takes in a catchment outside Schedule 2A, until the minimum flow has been set by a plan change, the minimum flow conditions of any primary allocation consents will provide for the maintenance of aquatic ecosystems and the natural character of the source water body.*

No minimum flow has currently been established for the catchments. It is recommended that a review condition is imposed to enable a minimum flow condition to be applied once should a minimum flow be set via a plan change, in accordance with Policy 6.4.4.

Policy 6.4.7 *The need to maintain a residual flow at the point of take will be considered with respect to any take of water, in order to provide for the aquatic ecosystem and natural character of the source water body.*

Residual flows have been proposed, considered and recommended, to allow for the protection of the aquatic habitat and natural character of this water body. The application is assessed as consistent with this policy.

Policy 6.4.16 *In granting resource consents to take water, or in any review of the conditions of a resource consent to take water, to require the volume and rate of take to be measured in a manner satisfactory to the Council unless it is impractical or unnecessary to do so.*

The applicants have been and proposes to continue to measure the water taken using a water meters, the data recorded electronically using a datalogger and sent to Council via telemetry. This should be secured by a condition of consent and will satisfy the relief sought by TAMI and Aukaha.

Policy 6.4.18 *Where a resource consent for the taking of water has not been exercised for a continuous period of 2 years or more, disregarding years of seasonal extremes, the Otago Regional Council may cancel the consent.*

The recommended water metering condition will allow the Council to monitor the rate and volumes of take, and ensure the water is being used efficiently. Should metering show the consent has been unexercised in accordance with this policy, the consent may be cancelled. A advice note to this effect has been recommended.

6.4.19 *When setting the duration of a resource consent to take and use water, to consider:*

(a) The duration of the purpose of use;

(b) The presence of a catchment minimum flow or aquifer restriction level;
(c) Climatic variability and consequent changes in local demand for water;
(d) The extent to which the risk of potentially significant, adverse effects arising from the activity may be adequately managed through review conditions;
(e) Conditions that allow for adaptive management of the take and use of water;
(f) The value of the investment in infrastructure; and
(g) Use of industry best practice.

The recommended term is discussed in section 10 below where the seven points above are discussed.

6.6.2 To promote the storage of water at periods of high water availability through:
(a) The collection and storage of rainwater; and
(b) The use of reservoirs for holding water that has been taken from any lake or river.

The applicant has two storage ponds with a combined storage capacity of 140,000m^3. The application is considered to be consistent with this policy.

Overall, the application is considered consistent with the provisions of the operative RPW.

8.11 Proposed Plan Change 7 (Water Permits)

Proposed Plan Change 7 (PPC7) was notified by the Council on the 18 of March and therefore the rules, objectives and policies in the plan change apply to the water permit. PPC7 was re-notified by ERA on 6 July 2020.

For applications to renew deemed permits expiring in 2021, and any other water permits expiring prior to 31 December 2025, PPC7 establishes a controlled activity consenting framework for short duration consents which comply with the controlled activity conditions. PPC7 also establishes a non-complying consenting framework for consents where a longer duration is proposed or where the application fails to meet one or more of the controlled activity conditions.

As the applicant seeks to irrigate more land than currently irrigated and the consent duration sought is more than 6 years, the water take does not meet the conditions of Rule 10A.3.1.1 and is, therefore, a non-complying activity under Rule 10A.3.2.1. It is noted that the retakes from the tributary of the Park Burn and Five Mile Creek are assessed as new takes and the rules set out in PPC7 do not apply.

Despite consent being required under Rule 10.3.2.1 as a non-complying activity, the application should continue to be processed as a restricted discretionary activity in accordance with section 88A(1A), being the activity status that applied under the RPW when the application was made.

It is noted that the retakes from the tributary of the Park Burn and Five Mile Creek are assessed as new takes and the rules set out in PPC7 do not apply. However, these still need to be assessed under the policy framework of PPC7.

The objective, policies and rules in PPC7 establish an interim planning and consenting framework to manage freshwater for the transition from deemed permits to RMA water permits while a long-term sustainable framework is prepared. PPC7 has been notified to implement the recommendations of the Minister for the Environment[3] following Professor Skelton's investigation of freshwater management and allocation functions at Otago Regional Council.[4]

Professor Skelton's report and the Minister's recommendations both highlighted inadequacies of the current planning framework in giving effect to the higher order documents, in particular the NPS-FM.While the comprehensive overhaul of the ORC planning framework is underway, the Minister considers that there is an urgent need to ensure that an interim framework is in place between now and 31 December. In his recommendation to ORC, the Minister stated:

> *"This is necessary to manage approximately 400-600 future consent applications in over allocated catchments. The possibility of up to 600 consents being granted under the current planning and consenting framework is problematic.I understand that around 70 per cent of ORC's currently issued water permits are for durations of 25-35 years, with various expiry dates. This includes over 50 permits that expire in 2050 or later, eight of which are 35 year permits issued this year. I am advised that there is a strong expectation from deemed and RMA water permit holders that their new consents will be for similarly long terms, and that the Council is likely to come under strong pressure to meet these expectations. In my view, long terms for these new consents would be unwise, as they would lock in unsustainable water use, inhibiting the council from effectively implementing the outcomes of its intended new RPS and LWRP."*

In response to Professor Skelton highlighting the importance of having robust interim measures in place to provide for short-term consents until the new regional policy statement and land and water regional plan are completed, the Minister formally recommended, under section 24A of the RMA that ORC:

> *Prepare a plan change by 31 March 2020 that will provide an adequate interim planning and consenting framework to manage freshwater up until the time that new discharge and allocation limits are set, in line with the requirements in the National Policy Statement for Freshwater Management.*

The Minister encouraged ORC to consider a narrow plan change that provides for a relatively low cost, and fast issuing of new consents on a short-term basis, as an interim measure until sustainable allocation rules are in place. These recommendations are reflected in Objective 10A.1.1 of PPC7 which provides:

Objective 10A.1.1 *Transition toward the long-term sustainable management of surface water resources in the Otago region by establishing an interim planning*

[3] Letter from David Parker (Minister for the Environment) to Otago Regional Council Councillors regarding the Minister's investigation of freshwater management and allocation functions at the Otago Regional Council (18 November 2019).

[4] Peter Skelton "Investigation of freshwater management and allocation functions at Otago Regional Council: (report to the Minister for the Environment, November 2019).

framework to manage new water permits, and the replacement of deemed permits and water permits to take and use surface water (including groundwater considered as surface water) where those water permits expire prior to 31 December 2025, until the new Land and Water Regional Plan is made operative.

This objective is implemented by the following policies and rules:

Policy 10A.2.1 *Irrespective of any other policies in this Plan, avoid granting resource consents that replace deemed permits, or water permits to take and use surface water (including groundwater considered as surface water under policy 6.4.1A (a), (b) and (c) of this Plan) where those water permits expire prior to 31 December 2025, except where:*

(a) The deemed permit or water permit that is being replaced is a valid permit; and
(b) There is no increase in the area under irrigation, if the abstracted water is used for irrigation; and
(c) There is no increase in the instantaneous rate of abstraction; and
(d) Any existing residual flow, minimum flow or take cessation condition is applied to the new permit; and
(e) There is a reduction in the volume of water allocated for abstraction.

Policy 10A.2.2 *Irrespective of any other policies in this Plan concerning consent duration, only grant new resource consents for the take and use of water for a duration of no more than six years.*

Policy 10A.2.3 *Irrespective of any other policies in this Plan concerning consent duration, only grant new resource consents that replace deemed permits, or resource consents that replace water permits to take and use surface water (including groundwater considered as surface water under policy 6.4.1A (a), (b) and (c) of this Plan) where those water permits expire prior to 31 December 2025, for a duration of no more than six years, except where Rule 10A.3.2.1 applies and:*

(a) The activity will have no more than minor adverse effects (including no more than minor cumulative effects) on the ecology and the hydrology of the surface water body (and any connected water body) from which the abstraction is to occur; and
(b) The resource consent granted will expire before 31 December 2035.

Rule 10A.3.2.1 *Despite any rule or rules in this Plan:*

a) Any activity that is the replacement of an activity authorises under a deemed permit; or
b) The take and use of surface water (including groundwater considered as surface water under policy 6.4.1A (a), (b) and (c) of this Plan) that is the replacement of a take and use authorised by an existing water permit where that water permit expires prior to 31 December 2025;

That does not meet any one or more of the conditions of Rule 10A.3.1.1. is a ***non – complying*** *activity.*

Policies 10A.2.1 and 10A.2.3 apply for RM20.007.01 to replace deemed permits and Policy 10A.2.2 applies to RM20.007.02 as these are new re-take permits.

As PPC7 has been notified, regard must be had to its provisions as well as the provisions of the operative RPW. While regard must be given to the provisions of PPC7, this does not necessarily mean giving full effect to its context. It is up to the decision-maker as to the weight that should be afforded to each of the matters under section 104(1).

In terms of weight applied to proposed provisions, the following has been distilled from case law as relevant for the decision maker to consider the weight to be applied to proposed provisions:

- The extent that it has progressed through the plan-making process[5];
- The extent that the proposed measure has been subject to independent testing or decision making[6];
- Circumstances of injustice[7];
- The extent to which a new measure, or the absence of one, might implement a coherent pattern of objectives and policies in a plan[8]; and
- Whether there has been a significant change in Council policy and the new provisions are in accordance with Part 2 of the RMA[9].

Based on these matters outlined above, it is considered that while the provisions are in their initial stages of the plan making process, they are particularly directive (use of 'avoid') and are a significant change from the operative provisions of the plan. As these provisions have been proposed in response to the Minister's recommendations as set out above, following an independent investigation undertaken by Professor Skelton with a particular focus on the management of freshwater, it is considered that they may better achieve the purpose and principles of the Act and the NPS-FM than current operative provisions. Otherwise, water permits granted under the current operative planning provisions have the potential to frustrate the new limits imposed in the new regional plan for land and water resources that is scheduled to be notified by December 2023, and made operative by December 2025.

While it is recognised that PPC7 is only an interim step to achieving the purpose of the RMA and giving full effect to the NPS-FM, the section 32 report for PPC7, identifies that it is a critical measure in order to achieve this purpose in a timely manner and ensures the current planning framework is more in accordance with Part 2 of the RMA in the interim period.[10] Furthermore, it is assessed that PPC7 implements a coherent pattern of objectives and policies as it is designed to be a standalone consenting regime for replacement deemed permits and water permits expiring before 31 December 2025.

It is recognised that this application was lodged prior to notification of PPC7 and, as such, the applicant has not had the benefit of the new controlled activity rule under PPC7 to obtain a

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[5] *Queenstown Central Ltd v Queenstown Lakes District Council* [2013] NZHC 815 at [9].
[6] *Hanton v Auckland City Council* [1994] NZMRA 289 (PT).
[7] *Keystone Ridge Ltd v Auckland Bity Council* (HC Auckland, AP24/01, 3 April 2001) at [16] and [37]; *Mapara Valley Preservation Society Incorporated v Taupo District Council* EnvC Auckland A083/07, 1 October 2007, at [51].
[8] *Keystone Ridge Ltd v Auckland Bity Council* (HC Auckland, AP24/01, 3 April 2001) at [16] and [37]; *Mapara Valley Preservation Society Incorporated v Taupo District Council* EnvC Auckland A083/07, 1 October 2007, at [51].
[9] *Keystone Ridge Ltd v Auckland Bity Council* (HC Auckland, AP24/01, 3 April 2001) at [16].
[10] Section 32 Evaluation Report for PPC7 dated 18 March 2020, p 18.

relatively low cost, short term consent. Rather, the applicant has engaged several experts to prepare a comprehensive assessment of environmental effects which consider the adverse effects are no more than minor. Furthermore, this application has been prepared in collaboration with RM20.003, RM20.005 and RM20.020 to ensure a holistic overview and management within the Amisfield Burn and Park Burn Catchments.

The provisions in PPC7 represent a significant shift in Council policy and that granting new consents for all expiring deemed permits would inhibit the Council from effectively implementing the outcomes of its intended new regional policy statement and land and water plan. As such, it is assessed that some weight should be placed, on the notified provisions and an assessment against the provisions is provided below.

The objective in PC7 requires a 'transition' toward long-term sustainable management of surface water. This relates to the management of surface water generally and the issues relating to large quantities of water being allocated to deemed permits or historic water permit (pre-RMA).

Policy 10A.2.1, provides strong direction to 'avoid' granting consent except where the provisions in (a) – (e) are met. As confirmed in the *King Salmon*[11]case, the word 'avoid' takes its ordinary meaning of 'not allow' or 'prevent the occurrence of'. In respect to this policy, it directs that the Council must avoid granting the consent, unless all of the provisions of (a) – (e) are met. In relation to these matters, the water permit that is to be replaced is 'valid'; there **is** an increase to the area of irrigation; there is no increase to the instantaneous rate of take; there was no existing residual or minimum flow on the current water permit and there is a reduction in the volume of water allocated of abstraction. As all of clauses (a) to (e) of Policy 10A.2.1 are not met, due to the increase in area of irrigation and term of consent sought, the granting of this application is contrary to this policy, specifically due to the directive nature of the policy.

Policy 10A.2.3 applies irrespective of any other policies concerning consent duration. It directs that new resource consents to replace deemed permits only be granted for a duration of no more than 6 years except where the activity will have no more than minor adverse effects (including no more than minor cumulative effects) on the ecology and the hydrology of the surface water body (and any connected water body) from which the abstraction is to occur. In that case a consent may be granted with an expiry of up to 31 December 2035. Notwithstanding the adverse effects, the applicant is seeking a duration of 35 years and the application is considered to be contrary to this policy in its current form. These policies are considered further in Section 10 of this report.

The activity would be a non-complying activity under the notified plan in accordance with rule 10A.3.2.1. However, it retains its activity status of Restricted Discretionary as it was lodged prior to the notification of PPC7. A non-complying activity status introduces the most onerous test for a consent application being the Section 104D 'gateway' test. This being that the consent authority may only grant consent if the application is not contrary to provisions of all planning documents or causes a no more than minor adverse effect. Given this application was lodged prior to the notification of PPC7 it retains the operative rule and its corresponding activity status and no further consideration to S104D is given.

8.11 Section 104(1)(c) - Any other matters

The Ngāi Tahu ki Murihiku Natural Resource and Environmental Iwi Management Plan 2008

[11] *Environmental Defence Society Incorporated v The New Zealand King Salmon Company Limited* [2014] NZSC 38 (King Salmon).

The Ngāi Tahu ki Murihiku Natural Resource and Environmental Iwi Management Plan 2008 - The Cry of the People, Te Tangi a Tauira is a relevant other matter for the consideration of this application. This is because the RPW is yet to be amended to take into account this Plan and this Plan expresses the attitudes and values of the four Rūnanga Papatipu o Murihiku – Awarua, Hokonui, Ōraka/Aparima and Waihōpai.

The following objectives and policies are of most relevance to these applications:

- Adopt the precautionary principle when making decisions on water abstraction resource consent applications, with respect to the nature and extent of knowledge and understanding of the resource.
- Support and encourage catchment management plans, based on the principle of *ki uta ki tai*, to manage the cumulative impacts of water abstractions in a given area.
- Require that scientifically sound, understandable, and culturally relevant information is provided with resource consent applications for water abstractions, to allow Ngāi Tahu ki Murihiku to fully and effectively assess cultural effects.
- Recommend, as a condition of consent, that any application for irrigation puts in on-farm rainwater holding facilities, to help with dairy washdown and irrigation.
- Encourage the installation of appropriate measuring devices (e.g. water meters) on all existing and future water abstractions, to accurately measure, report, and monitor volumes of water being abstracted, and enable better management of water resources.
- Advocate for durations not exceeding 25 years on resource consents related to water abstractions.
- Require that Ngāi Tahu are provided with the opportunity to participate through pre- hearing meetings or other processes in the development of appropriate consent conditions including monitoring conditions to address our concerns.
- Avoid adverse effects on the base flow of any waterway, and thus on the mauri of that waterway and on mahinga kai or taonga species.
- Ngāi Tahu's right to development, as per the Treaty of Waitangi, must be recognised and provided for with respect to water allocation from freshwater resources.
- Encourage water users to be proactive and use water wisely. To encourage best practice and efficient use of water, particularly in terms of:
  - sustainable irrigation design, delivery and management;
  - making best use of available water before water levels get too low;
  - reducing the amount of water lost through evaporation by avoiding irrigating on hot windy days.
- Consideration of consent applications for water abstractions should have particular regard to questions of:
  - how well do we understand the nature and extent of the water resource;
  - how well can we monitor the amount of water abstracted;
  - whether land capability (e.g. soil type, vulnerability of underlying groundwater resources) matches the land use enabled by irrigation;
  - what might happen in the future (e.g. rainfall and recharge of aquifers, climate change).
- Applications for water abstractions may be required to justify the quantities of water requested. Information may need to be provided to Te Ao Mārama Inc. regarding the proposed water use per hectare, estimated water losses, stocking rates, and the level of

efficiency for the scheme. This will enable iwi to put the quantity of water sought in context and ensure that a test of reasonableness can be applied to consents.

- Require catchment based cumulative effects assessments for activities involving the abstraction of water.
- The establishment of environmental flow regimes must recognise and provide for a diversity of values, including the protection of tangata whenua values.
- Ensure that environmental flow allocation and water management regimes for rivers recognise and provide for the relationship between water quality and quantity.
- Avoid compromising fisheries and biodiversity values associated with spring fed creeks and rivers for the purposes of water abstractions.

Te Ao Marama, Aukaha and TRONT were served notice of the application.

The submission by Te Au Marama Limited sought that the consent be declined, but if granted the following conditions be applied:

- That the consent term is a maximum of 6 years.
- That fish screens are consistent with NIWA Fish Screening Guidelines.
- Flows left in the waterway should be consistent with national direction.
- That the water take is metered in accordance with national direction.

The applicants have applied for a term more than 25 years which is inconsistent with the above plan and the submission point and would not be taking a precautionary approach. The need for fish screens has been assessed at Section 7.1 of this report. The applicants currently meter their takes and this will continue.

The applicants are seeking a rate and volume of water that is less than their historic use and has been assessed as efficient for the amount of land being irrigated. The applicants currently use a number of different irrigation methods, most of which are an efficient method by industry best standard. The effects of the take on ecological and natural values have been assessed as acceptable. With the exception of the term of consent the proposal is assessed as consistent with the above plan.

Kai Tahu ki Otago Natural Resource Management Plan 2005

The Kai Tahu ki Otago Natural Resource Management Plan 2005 (NRMP) is considered to be a relevant other matter for the consideration of this application becuase the RPW is yet to be amended to take into account the NRMP. The NRMP expresses the attitudes and values of the four Papatipu Rūnaka: Te Rūnanga o Moeraki, Kāti Huirapa Rūnaka ki Puketeraki, Te Rūnanga o Ōtākou and Hokonui Rūnanga. The following objectives and policies are of most relevance to this application:

- To require that resource consents applications seek only the amount of water actually required for the purpose specified in the application.
- To require that all water takes are metered and reported on, and information be made available upon request to Kai Tahu ki Otago.
- To oppose the granting of water take consents for 35 years.
- To encourage those that extract water for irrigation to use the most efficient method of application.

- To discourage over-watering.

Aukaha Limited on behalf of Nga Runanga:

- That the term of consent be no longer than 6 years.
- A minimum flow of 90% of the mean annual low flow (MALF) as calculated by the regional council and an allocation limit of, whichever is greater of:
    - 30% of MALF as calculated by the regional council
- Retain existing requirements for water meter(s) and ensure results continue to be recorded and reported via telemetry.

The applicants are seeking an amount that has been assessed as efficient and will continue to meter the abstractions. The applicants currently use a number of different irrigation methods, the majority of which are an efficient method by industry best standard, and only a small area of land is not considered to be irrigated efficiently. The applicant has committed to ongoing improvements in water use infrastructure, exemplified by some conversion from flood irrigation to spray. Water harvesting and storage takes place within the command area via two reservoirs.

A term of 35 years has been applied for which is inconsistent with the NRMP and would not be taking a precautionary approach. Aukaha Limited has submitted opposing the application requesting a term no longer than 6 years.

Te Rūnanga o Ngāi Tahu Freshwater Policy Statement 1999

The Ngāi Tahu Freshwater Policy Statement 1999 (NTFP) is considered to be a relevant other matter for the consideration of this application because the RPW is yet to be amended to take into account the NTFP. The NTFP expresses the attitudes and values of Te Rūnanga o Ngāi Tahu

The following objectives and policies are of most relevance to this application:

6.1 – Wāhi Tapu: To afford total protection to waters that are of particular spiritual significance to Ngai Tahu.

- *Identify sites for immediate protection because of their significance as wāhi tapu.*

The location of the take has not been identified as a site of significance as wāhi tapu.

*6.2 – Mauri**:** To restore, maintain and protect the mauri of freshwater resources.*

- *Identify freshwater resources where:*
    - *Mauri is unaffected by modification and human activity so that these waterbodies can be afforded total protection; and*
    - *Mauri is adversely affected, and the activities that cause such affects.*
    - *Accord priority to ensuring the availability of sufficient quantities of water of appropriate water quality to restore, maintain and protect the mauri of a waterbody, in particular priority is to be accorded when developing water allocation regimes.*

The application is for water takes within an area that has been modified by human activity and where water is currently taken from. Aukaha Limited made a submission on behalf of Kāti Huirapa Rūnaka ki Puketeraki, Te Rūnanga o Ōtākou and Hokonui Rūnanga (Ngā Rūnanga) and stated

that a resource's mauri is desecrated if it no longer supports the traditional uses and values. A water body or other natural resource can be desecrated by improper resource management activities. These may extinguish the mauri and in turn diminish the association upon which a range of values are based, including mahika kai, for Ngā Rūnanga who hold traditional rights and responsibilities in respect to the resource. A residual flow for each of the water courses is proposed.

6.3 – Mahinga Kai: To maintain vital, healthy mahinga kai populations and habitats capable of sustaining harvesting activity.

- *Protect critical mahinga kai habitats and identified representative areas*
- *Restore and enhance the mahinga kai values of lakes, rivers, streams, wetlands, estuaries and riparian margins.*
- *Ensure that activities in the upper catchment have no adverse effects on mahinga kai resources in the lower catchments*
- *Restore access to freshwater resources for cultural activities, including the harvest of mahinga kai.'*

Aukaha has stated in its submission that the Clutha/Mata-au River was part of ara tawhito, mahika kai trail that led inland. Mahika kai sourced from the Clutha/Mata-au Catchment includes indigenous ika and manu such as: tuna, kanakana, kōkōpu, moa, inaka, weka. As noted above the residual flow regimes are proposed.

It is considered that, overall, the application is generally consistent with the objectives and policies of the NTFP.

Professor Skelton's Report and Minister's Recommendations

Professor Peter Skelton was engaged by the Hon David Parker, Minister for the Environment (the Minister) to investigate whether the ORC is adequately carrying out its functions under section 30(1) of the RMA in relation to freshwater management and allocation, particularly the implementation of the NPS-FM.

The October 2019 report concluded that the current planning framework in Otago is not fit for purpose to appropriately consider resource consent applications for new water permits before the expiry of deemed permits in October 2021. It also identified the need for an accelerated full review of the Water Plan (to notify a new Land and Water Plan by December 2023) and a full review of the Regional Policy Statement (to notify by November 2020).

To bridge the gap between the expiry of deemed permits in Otago in 202 and other water permits expiring prior to a full plan review, and when a new Regional Policy Statement and Land and Water Plan for Otago will be operative, the Minister has recommended an interim change to the Water Plan. This has recently been notified as Proposed Plan Change 7 (Water Permits) (PPC7).

However, the weight placed on these matters is not determinative of the consent application in regard to granting the consent. This report has been considered but has not changed the recommendation to grant the consent.

8.12 Section 104(2A) Value of Investment

When considering an application affected by Section 124 of the Act, the Council must have regard to the value of the investment of the existing consent holder.

The application states that the applicant has invested much time, energy and money into the farm, and all of the applicant's economic and social welfare lies in the productive capacity of their lands. Without water for irrigation, pastures could not be supported during the growing season. Feed would have to be imported onto the farm at a huge cost. Furthermore, the permits subject to this application provide the only secure and consistent source of water for stock drinking, which is an important animal welfare consideration.

the applicant advises that its abstractions are long-established, and the conveyance and storage infrastructure is already in place at considerable cost to keep these in working condition. The proposed takes will supply irrigation infrastructure that is in place and established, with recognition of reasonably foreseeable future expansion. The applicant has committed to ongoing improvements in water use infrastructure, exemplified by conversion from flood irrigation to spray. Water harvesting and storage takes place within the command area via two reservoirs.

Overall, it is considered that the applicant has demonstrated an adequate level of investment.

8.13 Section 124B Applications by Existing Holders of Resource Consents

The following criteria must be considered when a person who holds an existing resource consent makes an application within Section 124 timeframes and the consent authority receives one or more other applications to use some or all of the natural resource to which the existing consent relates::

(a) the efficiency of the person's use of the resource; and

(b) the use of industry good practice by the person; and

(c) if the person has been served with an enforcement order not later cancelled under section 321, or has been convicted of an offence under section 338,
   (i) how many enforcement orders were served or convictions entered; and
   (ii) how serious the enforcement orders or convictions were; and
   (iii) how recently the enforcement orders were served or the convictions entered.

While there are no such other applications currently before the Council, the factors have been assessed for completeness and in the event any other application is lodged before this application is determined.

The applicants have applied for irrigation water which is considered efficient by Aqualinc plus stock water. The applicants seek to take less water than currently allocated and will apply it to a greater land area.

There is use of inefficient irrigation practices such as boarder dyke/flood irrigation for a small area but the applicants committed to upgrading the irrigation system over time where practical. All other irrigation methods for the majority of the land is considered to be efficient. The applicant has invested a significant amount of capital to improve efficiency such as race maintenance and water storage options and further improvements are proposed.

No enforcement orders have been issued against the applicant.

8.14 Part 2 of the Act

Under Section 104(1) of the RMA, a consent authority must consider resource consent applications "subject to Part 2" of the RMA, specifically, sections 5, 6, 7 and 8.

The Court of Appeal has recently clarified how to approach the assessment of “subject to Part 2” in section 104(1). In *R J Davidson* the Court of Appeal found that (in summary):[12]

Decision makers must consider Part 2 when making decisions on resource consent applications, where it is appropriate to do so. The extent to which Part 2 of the RMA should be referred to depends on the nature and content of the planning documents being considered.

Where the relevant planning documents have been prepared having regard to Part 2 of the RMA, and with a coherent set of policies designed to achieve clear environmental outcomes, consideration of Part 2 is not ultimately required. In this situation, the policies of these planning documents should be implemented by the consent authority. The consideration of Part 2 "would not add anything to the evaluative exercise" as "genuine consideration and application of relevant plan considerations may leave little room for Part 2 to influence the outcome". However, the consideration of Part 2 is not prevented, but Part 2 cannot be used to subvert a clearly relevant restriction or directive policy in a planning document.

I have assessed matters in Part 2 as to assist the decision maker.

The relevant matters under section 6 of the Act, have been recognised and provided for. The natural character of the waterbody will be unaffected by the proposed abstraction (section 6(a)). The proposal will not affect any outstanding natural features or landscapes (section 6(b)). The Park Burn and Five Mile Creek do not provide habitat for any significant indigenous fauna. The Amisfield Burn catchment provides known habitat for koaro but the proposal is considered to maintain this habitat (section 6(c)). Where public access exists, this will be maintained (section 6(d)). The relationship of Maori and their culture and traditions with water has been recognised through the identification of iwi as affected parties. The submissions of Aukaha and TAMI have been considered and the recommendations of this report have provided for the relief sought where appropriate (section 6(e)).

Particular regard has been given to kaitiakitanga (section 7(a)). It is considered that the rates and volumes of abstraction will not cause the mauri of the waterbodies to be degraded beyond its current state. This will ensure that a degree of kaitiakitanga is maintained which recognises the relationship between Maori and the water. Particular regard has also been given to the efficient use and development of natural and physical resources and the Applicants efficient use of water has been recognised (section 7(b)). The need to protect the habitat of trout has been considered and it is considered that the residual flows and fish screening will be an appropriate measure to do this (section 7(h)). With the recommended conditions, I consider the application is consistent with the “other matters” of Section 7 of the Act.

The principals of Te Tiriti o Waitangi, including active protection, equity and participation, have been taken into account in accordance with section 8. Of significance is the Treaty principle of active protection. This needs to be understood as it relates to the mauri of waterbodies. Degradation of mauri can diminish associations and prevent cultural uses, which may occur when an application is taking a significant proportion or all of a waterbody over a long period of time. The proposed conditions and the consent term of 15 years should address this issue. However, it is acknowledged that Aukaha have requested a duration of 6 years in their submission. Active protection is linked to Article Two of the Treaty and partnership

[12] *R J Davidson Family Trust v Marlborough District Council* [2018] NZCA 316.

responsibilities. When the mauri of waterbodies is degraded, this demonstrates a lack of active protection. Addressing degradation of mauri aligns with national direction around Te Mana o te Wai, which has been assessed in the section of this report on the NPS-FM.

8.15 Section 108 and 108AA of the Act

The attached conditions on RM20.007.01 and RM20.007.2 are recommended in accordance with Sections 108 and 108AA of the Act. As discussed above, it is considered appropriate to reduce the monthly allocation sought to reflect the actual maximum monthly take as recorded in the past five years as follows:

- The rate of take from Breakneck Creek and Amisfield Burn must not exceed 97.3 l /second
- The rate of take from Park Burn must not exceed 92.3 l/second
- The combined monthly allocation must not exceed 546,184m^3
- The combined annual allocation must not exceed 2,640,354m^3

The applicant is reliant on productive pastures for sheep and beef farming. When assessing the historic water use summarised by the system and information analysist, the following data is relevant:

In addition to rate and volume conditions, the following conditions have been offered by the applicant:

•The consent holder shall maintain a water meter to record the water take, at or close to the point of take, within an error accuracy of +/-5% over the meter's nominal flow range, and a telemetry compatible datalogger with at least 24 months data storage and a telemetry unit to record the rate and volume of take, and the date and time this water was taken. The datalogger must record the date, time and flow in L/s. Data shall be provided to the Consent Authority by means of telemetry. The consent holder must ensure data compatibility with the Consent Authority's time-series database. The water meter must be installed according to the manufacturer's specifications and instructions. There must be enough space in the pipe/flume to allow for verification of the accuracy of the meter under Condition (X).

•The Consent Holder must ensure the full operation of the water meter, data logger and telemetry unit at all times during the exercise of this consent. All malfunctions of the water meter and/or datalogger during the exercise of this consent shall be reported to the Consent Authority within 5working days of observation and appropriate repairs must be performed within 5working days. Once the malfunction has been remedied, a Water Measuring Device Verification Form completed with photographic evidence must be submitted to the Consent Authority within 5working days of the completion of repairs.

•If a mechanical insert water meter is installed it shall be verified for accuracy each and every year from the first exercise of this consent. An electromagnetic or ultrasonic flow meter shall be verified for accuracy every 5 years from the first exercise of this consent. Each verification must be undertaken by a Consent Authority approved operator and a Water Measuring Device Verification Form must be provided to the Consent Authority within 5 days of the verification being performed, and at any time upon request.

•The consent holder shall take all practicable steps to ensure that:

- *There is no leakage from pipes and structures;*
- *The use of water is confined to the target areas.*

•The Consent Authority may, in accordance with Sections 128 and 129 of theRMA1991, serve notice on the consent holder of its intention to review the conditions of this consent within 3 months of each anniversary of the commencement of this consent for the purpose of:

- *Adjusting the consented rate or volume of water under Conditions X and X, should monitoring under Condition X or future changes in water use indicate that the consented rate or volume is not able to be fully utilised; or*
- *Determining whether the conditions of this consent are adequate to deal 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; or*
- *Ensuring the conditions of this consent are consistent with any NES, relevant plans and/or the OtagoRPS; or*
- *Adjusting or altering the method of water take data recording and transmission.*

The applicant also offers a 50/50 flow share regime for the Amisfield Burn and Breakneck Creek, along with a residual flow of 10 l/s to be carried down from RM15.007.01 onto this consent. The ORC freshwater ecologist also recommends a visual residual flow for the tributary of the Park Burn at the point of retake. The residual flows are intended to protect ecological and natural character values.

With regard to fish screening, the ORC RSU recommends that fish screens are installed at the outlet of the applicant's 120,000m^3 storage pond to ensure that fish are not pumped out of the conveyance system.

The above conditions are considered appropriate and it is recommended that these be applied to the consent.

9. Recommendation

9.1 Reason for Recommendation

It is recommended that this consent application is approved subject to the appended conditions and for the recommended term of 15 years because:

a. The adverse effects are no more than minor as the various proposed provisions such as residual flows will avoid, remedy or mitigate adverse effects.
b. The proposed activity is consistent with the objectives and policies of the operative Regional Plan: Water specifically as the applicants are applying for less allocation than that which was previously consented as primary allocation.
c. The use of the water is efficient and the volumes applied for have been shown to be efficient through Aqualinc and other calculations.
d. No additional water beyond that taken in the past five years (as confirmed by data analysis) is recommended.

e. The application is consistent with the NPS-FM as the proposed take is not causing any further allocation and is reducing any allocation as the recommended instantaneous rate of take is less than that currently consented.
f. The proposal will not hinder the implementation of an NPS-FM compliant Plan as future allocation limits can be imposed upon renewal of this consent.
g. No matters have arisen in the assessment of the application that would indicate the application should have been publicly notified.

10. Term of Consent (Section 123)

The Applicants have requested a duration of 35 years to ensure financial security and reflect the existing and proposed level of investment. It is considered that a duration of 15 years is more appropriate. In reaching this recommendation the following relevant factors have been considered:

- The duration of a resource consent should be decided in a manner which meets the RMA's purpose of sustainable management;
- Whether adverse effects would be likely to increase or vary during the term of the consent;
- Whether there is an expectation that new information regarding mitigation would become available during the term of the consent;
- Whether the impact of the duration could hinder implementation of an integrated management plan (including a new plan);
- That conditions may be imposed requiring adoption of the best practicable option, requiring supply of information relating to the exercise of the consent, and requiring observance of minimum standards of quality in the receiving environment;
- Whether review conditions are able to control adverse effects;
- Whether the relevant plan addresses the question of the duration of a consent;
- The life expectancy of the asset for which consents are sought;
- Whether there was significant capital investment in the activity/asset; and
- Whether a particular period of duration would better achieve administrative efficiency.

Policy 6.4.19 of the RPW states that when considering the duration of a resource consent to take and use water the following are considered:

- The duration of the purpose of use;
- The presence of a catchment minimum flow or aquifer restriction level;
- Climatic variability and consequent changes in local demand for water;
- The extent to which the risk of potentially significant adverse effects arising from the activity may be adequately managed through review conditions;
- Conditions that allow for the adaptive management of the take and use of water;
- The value of the investment in infrastructure; and
- Use of industry best practice.

The explanation to the policy states the following:

> *The duration of each resource consent to take and use water should have regard to the particular circumstances of the activity and its likely environmental effects, but there needs to be good reason for Council to reduce the duration of consents from that required for the purpose of use. There can be tension between granting sufficiently long consent durations to enable continued business viability and managing the greater environmental risk associated with long duration consents.*

Where more is known about a water resource, such as when a catchment minimum flow has been specified in Schedule 2B, or an aquifer restriction level has been specified in Schedule 4B, and a council approved rationing regime will be adhered to, the risk of adverse effects being unforeseen is reduced and longer duration consents may be appropriate.

Consent review provisions provide an opportunity to allow longer consent durations while ensuring the requirements of this Plan are met over time. Where there is a higher degree of risk of adverse effects, uncertainty of longer term availability of the water resource, or the applicant is unwilling to volunteer adaptive management conditions (it may be too difficult to set suitable review conditions), a shorter duration consent may be appropriate.

Adaptive management provisions may be volunteered in situations where there is uncertainty about the response required to meet future change, including rapidly changing technology or a rapidly changing environment. Such provisions enable a proposal to proceed with sufficient, but not exhaustive, assessments of all risks and contingencies. Environmental standards initially set may be varied to be more or less restrictive over

Policy 6.4.19 of the RPW addresses consent duration for consents to take and use water. It does not recommend actual durations but instead contains seven criteria for to consider. In this case:

- Criteria (a) - the proposed purposes of the abstractions are enduring; being irrigation and stock water.

- Criteria (b) - there are no minimum flows on the catchments within the application.

- Criteria (c) - climatic variability is certain to occur but no detailed evidence of its relevance has been supplied.

- Criteria (d) - potential adverse effects (such as inadequate residual flows or downstream minimum flow) can be addressed through robust review conditions. However,there are limitations on how the Council can deal with allocation through the review of consent conditions and the extent of changes that can be made given that the effect of the change of conditions on the continued viability of the activity must be considered as part of any review. It is not yet known what the outcome of the Council's future planning programme may be and therefore the extent of changes required to conditions to bring the consent into line with the new planning framework. As such, a longer term of 35 years which relies on a review condition to manage effects is not considered appropriate.

- Criteria (e) - the applicant has not proposed adaptive management, although review conditions will allow allocation and residual flow matters to be addressed in the future should the need arise.

- Criteria (f) -the applicants have invested heavily in irrigation infrastructure and will need to continue to invest in water storage options and conversion from the small area of flood irrigation to spray irrigation in the near future,

- Criteria (g) - there is small area of inefficient irrigation practices (flood irrigation) but the applicants have proposed that there will be upgrades to the overall system in the future.

According to the application, the applicant has invested to improve efficiency over the last few years. These efficiency improvements include race maintenance and water storage solutions.

The recommended duration of 15 years will provide security to the applicants and will reduce risks which is consistent with Policy 6.4.19.

The Kai Tahu ki Otago Natural Resource Management Plan 2005 oppose consents granted for up to 35 years and the Ngāi Tahu ki Murihiku Natural Resource and Environmental Iwi Management Plan 2008 advocate for terms of consent not greater than 25 years. Aukaha in their submission have sought 6 years based primarily on the inadequacy of the current planning framework. The recommended term of 15 years is consistent with the relevant iwi management plans and is in accordance with PPC7 which is the first step by Council to align the planning framework with the NPS-FM 2014 (amended 2017).

As noted in Section 8.10, Policy 10A2.2 applies to the applications to retake the water from the tributary of the Park Burn and Five Mile Creek (RM20.007.02) and Policy 10A.2.3

applied to the replacement deemed permits applied for under RM20.007.01.

Policy 10A.2.2 *Irrespective of any other polices in this Plan concerning consent duration, only grant new resource consents for the take and use of water for a duration of no more than six years.*

Policy 10A.2.3 *Irrespective of any other policies in this Plan concerning consent duration, only grant new resource consents that replace deemed permits, or resource consents that replace water permits to take and use surface water (including groundwater considered as surface water under policy 6.4.1A (a), (b) and (c) of this Plan) where those water permits expire prior to 31 December 2025, for a duration of no more than six years, except where Rule 10A.3.2.1 applies and:*

(a) The activity will have no more than minor adverse effects (including no more than minor cumulative effects) on the ecology and the hydrology of the surface water body (and any connected water body) from which the abstraction is to occur; and

(b) The resource consent granted will expire before 31 December 2035.

Policy 10A.2.3 of PPC7 directs that new consents to replace deemed permits only be granted for no more than 6 years except where there are no more than minor adverse effects (including cumulative effects) on the ecology and the hydrology of the surface water body (and any connected water body) from which the abstraction is to occur. This is irrespective of any other policies in the Plan concerning consent duration, i.e. Policy 6.4.19.

The new application (RM20.007.02) to retake the water allocated under RM20.007.01 (should consent be granted) and delivered for the purpose of the express purpose of taking is required to have a term no longer than six years in any circumstance.

Considering this direction, granting the consent duration sought by the applicants is contrary to the provisions of PPC7. Given the overall effects conclusion that the adverse effects (including cumulative effects) on aquatic ecology and hydrology are no more than minor, a duration of 15 years for RM20.007.01 would be consistent with Policy 10A.2.3. As discussed in Section 8.10,

while some weight can be given to PPC7, it is appropriate to continue to give weight to Policy 6.4.19 of the RPW.

In this instance, I consider that a 15 year consent term is appropriate for all activities on the basis that:

- A 15-year duration will provide the applicant with security of access to surface water resources, ensures efficient use of water and safeguards the life-sustaining capacity of the watercourses.
- A term of 15 years is considered to strike an appropriate balance between the term sought by the applicants and the significant shift in Council policy under PPC7 to have interim measures in place to provide for short term consents until the new regional policy statement and land and water regional plan are completed.
- PPC7 contains a coherent set of policies and is intended as a stand-alone consenting regime and an interim step in giving full effect to the NPS-FM;
- The adverse effects of the proposed take are no more than minor and ultimately acceptable; and
- Unforeseen adverse effects can be managed by review conditions during the consent term.

It is recommended that a lapse duration of 2 years is applied rather than the default 5 years provided for by section 125 of the RMA. This lapse period recognises the finite nature of the resource and competing local demand and prevents the resource being tied up. Overall, it ensures efficiency of resource allocation.

Appended: Recommended Conditions of Consent

Appended: Evidence of Ciaran Campbell – ORC Freshwater Ecologist

Appended: Analysis of Sarah McCorrie – ORC Systems and Data Analysis

Appended: Assessment of Cameron Jasper – Pattle Dalamore Partners Limited

Kirstyn Lindsay
Consultant Planner
Southern Planning Solutions

Otago Regional Council

Recommended Conditions of Consent

Otago Regional Council

Otago Regional Council

Evidence of Ciaran Campbell – ORC Freshwater Ecologist

BEFORE THE COMMISSIONERS ON BEHALF OF THE OTAGO REGIONAL COUNCIL

Consent No. RM20.007

BETWEEN	SMALLBURN LIMITED
	Applicant
AND	OTAGO REGIONAL COUNCIL
	Consent Authority

EVIDENCE OF CIARAN SEWELL MERRICK CAMPBELL

Introduction

1. My full name is Ciaran Sewell Merrick Campbell.
2. I am a Freshwater Ecologist at Otago Regional Council. I hold the following tertiary qualifications; a Bachelor of Science (Ecology and Zoology double major) from Massey University and a Postgrad Diploma in Wildlife Management with Distinction from the University of Otago.

3. I specialise in freshwater ecological research and management of native freshwater fish. I was a freshwater fisheries specialist for the Department of Conservation from 2011 to 2019.

4. I am currently working my way towards a Master of Science (Zoology) through University of Otago, my project focusing on using genomic data to inform phylogenetics, and ultimately formal species descriptions, of threatened non-migratory galaxias fishes in Otago.

5. During the last ten years I have undertaken freshwater fish surveys throughout Otago catchments, and extending into the Waitaki catchment. I have considerable and contemporary understanding on the freshwater ecosystems and fish species of Otago from my employment and tertiary studies.

6. I confirm that I have read and agree to comply with the Environment Court Code of Conduct for Expert Witnesses (Consolidated Practice Note 2014). This evidence is within my area of expertise, except where I state that I am relying on the evidence or information provided by another parties. I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

Scope of Evidence

7. My evidence addresses:
    - An assessment of the nature and ecology of affected waterways
    - Considerations for residual flows at point-of-take
    - Consideration of residual flows for retakes
    - Consideration of fish screens

8. To inform my assessment, I have used

- Freshwater fisheries data provided by the New Zealand Freshwater Fish Database (Crow 2017) - henceforth referred to as NZFFD.
- Consent Application RM20.007.01
- An ecological assessment report (Allibone 2019)
- Technical comments provided by Landpro (2019a, 2019b) for this application
- Hydrological evidence prepared by Xiaofeng Lu – ORC Hydrologist.
- Observations I made during a site visit, 7 February 2020.
- Ecological advice from my colleague, Jason Augspurger.

Ecological values – freshwater fish and regionally significant wetlands

9. To consider the ecological values of the site, NZFFD records were combined with a recent survey report provided in the consent application.

10. The NZFFD provides presence/absence data for fish species at 16 sites in the Amisfield Burn, Park Burn and Five Mile Creek catchments. Records exist for fish surveys from 1996, 2001, and 2018 (Fig. 1, Table 1). There are three fish species recorded since 1996: brown trout (*Salmo trutta*), upland bully (*Gobiomorphus breviceps*) and kōaro (*Galaxias brevipinnis*).

11. Since 2018, a survey was completed in the Amisfield Burn and Park Burn catchments by Dr Richard Allibone of Waterways Consultants Ltd. Brown trout were detected at seven sites and a single rainbow trout (*Oncorhynchus mykiss*) was detected at one site (Allibone 2019).

12. Sampling across the catchments is not extensive, however in my opinion, there is sufficient data to determine fish values.

13. Brown trout and rainbow trout are introduced sports fishes that appear to have formed a self-supporting, stunted population in these catchments (Allibone 2019) which are highly unlikely to be acting as a nursery to the downstream Lake Dunstan fishery due to the ephemeral nature of the waterways.

14. Upland bullies prefer lower velocity areas and typically have life histories that do not include migration. There are scattered populations of upland bullies in the Lake Dunstan catchment. Upland bullies are classified as Not Threatened (Dunn et al. 2018). The limited distribution of upland bullies in the affected waterways, coupled with their preference for low water velocity reduces the need for residual flow considerations at the point of take.

15. Kōaro are classified as At Risk and Declining with a qualifier of partial decline (Dunn et al. 2018). This indicates that the threat classification panel consider kōaro are in decline only in some regions of New Zealand. Landlocked populations of kōaro do not appear to be in decline, justifying the "partial decline" qualifier.

16. Two adult kōaro have been recorded since 1996 in the waterways affected by the consent application. It is not unusual to observe an individual kōaro in streams in this region. However, this does not necessarily indicate that whitebait runs coming from Lake Dunstan occur (Jason Augspurger, pers. comm.). An overview of the very few NZFFD kōaro records nearby highlights their scarcity with three or fewer kōaro observed at each site (Fig. 2).

17. There are conservation concerns associated with the expansion of kōaro upstream of inland lakes in Otago, particularly on their negative interactions with threatened non-migratory species such as Clutha flathead galaxias (*Galaxias* "species D") – which is classified as Threatened – Nationally Critical (Dunn et al. 2018).

18. Although there is no evidence that suggests Clutha flathead galaxias are in the affected catchments, it makes little sense to provide residual flow considerations for kōaro given:
    - Limited records of kōaro nearby; and
    - Low abundances of kōaro where recorded nearby; and
    - The potential negative impacts of kōaro on threatened species in nearby catchments.

19. Regionally Significant Wetlands are listed in Schedule 9 of the Regional Plan: Water for Otago. There are no Regionally Significant Wetlands that will be affected, adversely or otherwise, by the proposed water takes and retakes.

Hydrology – Breakneck Creek, Amisfield Burn, Park Burn, Five Mile Creek and tributaries

20. These waterways flow roughly parallel in an easterly direction from the upper Pisa Range, descending rapidly before flattening out as they reach the valley floor on their way towards Lake Dunstan. To understand the waterways, water races, water takes and water retakes with regard to this consent application I have provided a schematic (Fig. 3).

21. Based on the data provided in the application and MALF statistics (57L/s – Appendix 1) provided by ORC Hydrologist, waterways affected by this consent application are naturally ephemeral due to loss of surface water to ground in reaches on the valley floor (Landpro 2019a, Landpro 2019b, Allibone 2019).

22. In my opinion, residual flows below water takes should maintain flow connectivity through the point of take to allow invertebrates to drift downstream and move upstream. In my original assessment (Objective Id A1327635), I recommended that a residual flow should be suggested by the applicant to look after natural character of the Breakneck Creek and Amisfield Burn below the points of take. The applicant responded by suggesting that there was a 10L/s residual flow proposed for the Park Burn take and the open channel diversions at current takes in Breakneck Creek (96320) and Amisfield Burn (96321) allow for roughly 50% of the flow to pass the intake, even during low flows (Objective Id A1367094). This equates to a 50:50 flow sharing regime. This supports considerations raised by the Department of Conservation in their advisory letter (Objective ID 1365692, DOC-6361452, dated 13 July 2020).

23. Otago Regional Council does not have flow recorders in every waterway along the eastern side of the Pisa Range, however a flow recorder was installed in the Amisfield Burn in 2013. The flow data provided from this recorder was used by ORC Hydrologist Xiaofeng Lu in developing modelled flow statistics with particular focus on a method for establishing residual flows on retakes – see *memo supplied by Xiaofeng Lu* (Appendix 1). Note that the Amisfield Burn flow recorder is not impacted by any water abstraction or augmentation, therefore the recorded flows can be considered natural.

24. In my opinion, any residual flow downstream of retakes should ensure only retake water is taken and natural flows remain. The Department of Conservation raised how best to ensure only retake water within Five Mile Creek and Park Burn Tributary is taken and any natural flow remains (Objective ID 1365692, DOC-6361452, dated 13 July 2020). To provide for that consideration, ORC hydrologist Xiaofeng Lu has calculated natural flows upstream of the retake points, which can be used to establish residual flows downstream of retakes. These values are summarised in Table 3, with more detail provided in the memo (Appendix 1).

25. During low flows, recharged waterways (Park Burn Tributary and Five Mile Creek) appear to be so small that retake is likely to be capturing only augmented water. In addition to this it is difficult to quantify flow statistics, due to the small flow dataset across a short time period. Based on this, there is difficulty quantifying numerical residual flows downstream of retakes.

26. Five Mile Creek appears to be almost entirely augmented water at low flows, no residual flow is proposed for this retake.

27. A residual flow established for the retake on Park Burn Tributary should maintain flow connectivity through the point of take to allow invertebrates to drift downstream and move upstream. Quantifying a numerical residual flow is difficult, therefore a visual residual flow immediately downstream of the Park Burn Tributary retake is recommended.

28. I have made further consideration to the potential for fish screens relevant to this application. In my original assessment (Objective Id A1327635) I made no comment on fish screens. The hydrological nature and connectivity of these catchments is complex and highly variable. To prevent unnecessary mortality, freshwater fishes should be able to move freely between natural waterways, water races, and storage ponds within the systems affected by this application. To further prevent unnecessary mortality, a fish screen should be installed on the outlet from the larger 120,000m^3 storage pond. A drum-shaped screen with 3mm mesh is recommended (Jamieson et al. 2007).

Recommendations

29. My recommendation is that further work is required to establish an agreed water take structure/design that provides the agreed 50:50 flow sharing regime and residual flow on Park Burn Tributary retake. Monitoring of residual flows should be in the form of photographs on regular fortnightly basis, photo points will need to be set up. These photographs then should be forwarded on to the Consenting Authority.
30. A 3mm fish screen is recommended to be attached to the outlet of the large storage pond.

Summary

31. The waterways affected by this consent application are small, ephemeral creeks situated in the Pisa Range, Lake Dunstan catchment.
32. They are connected via water races and contain a small, self-sustaining population of brown trout, occasional rainbow trout and very few native fish.
33. I recommend monitored 50:50 flow sharing regimes on takes in Breakneck Creek and Amisfield Burn as residual flow.
34. I recommend maintaining the 10L/s residual flow proposed for the Park Burn water take.
35. I recommend visual residual flow on Park Burn Tributary retake.

Ciaran Campbell

28 July 2020

Figure 1. NZFFD records from the catchments affected by RM20.007.

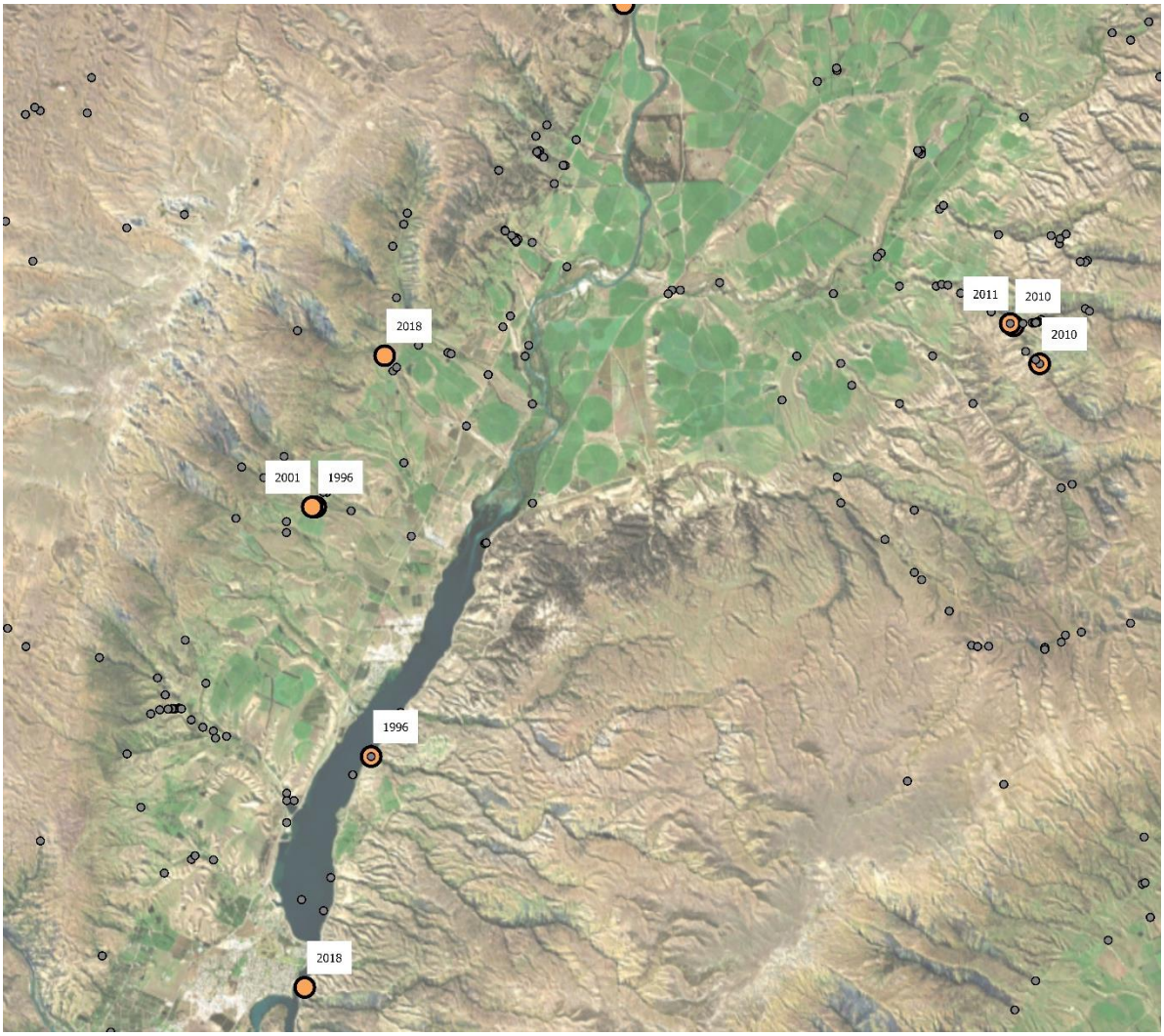


Figure 2. NZFFD records of kōaro (orange, labelled by year recorded) nearby to waterways affected by this consent application – no record in this area contains more than three kōaro. Also shown are all NZFFD records (grey).

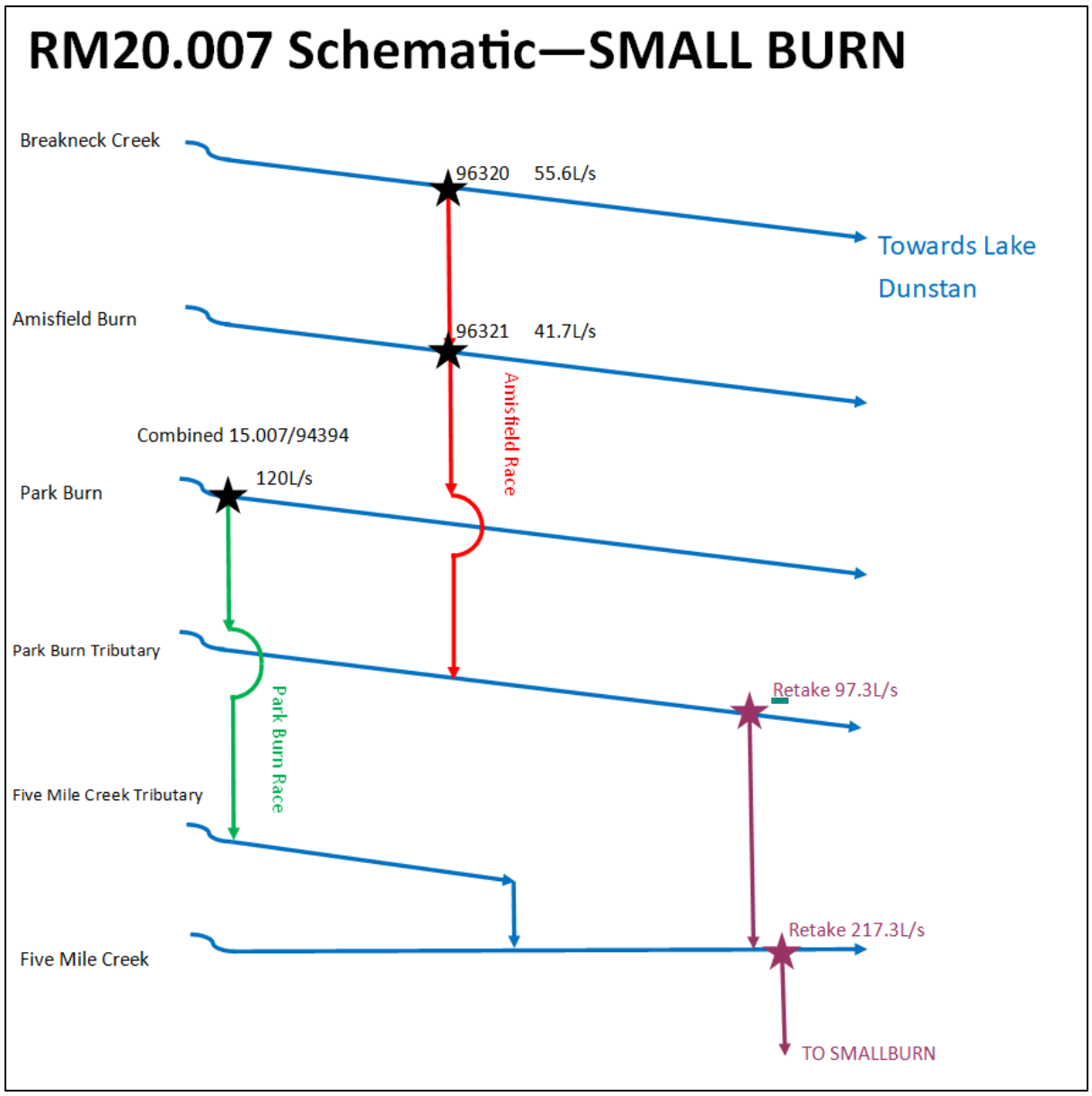


Figure 3. Schematic of the water takes and retakes within various watercourses relating to Consent Application RM20.007.01.

Table 1. NZFFD data from Amisfield Burn, Breakneck Creek and Park Burn catchments

card	m	y	location	org	east	north	fishmeth	species	abundance or number
15505	1	1996	Breakneck	doco	2212600	5580000	efp	brown trout	12
15506	1	1996	Amisfield	doco	2212300	5579600	efp	brown trout	a
15506	1	1996	Amisfield	doco	2212300	5579600	efp	kōaro	1
15509	1	1996	Amisfield	doco	2211300	5580100	efp	brown trout	a
25145	1	2001	Amisfield	doco	2214900	5578800	obs	nospec	
25259	5	2001	Breakneck	doco	2212500	5580000	efp	nospec	
25260	5	2001	Amisfield	doco	2212200	5579600	efp	brown trout	14
25260	5	2001	Amisfield	doco	2212200	5579600	efp	kōaro	1
114078	4	2018	Breakneck	rdcl	2211434	5580975	efp	nospec	
114080	4	2018	Amisfield	rdcl	2213258	5579491	efp	brown trout	18
114080	4	2018	Amisfield	rdcl	2213258	5579491	efp	upland bully	11
114083	4	2018	Amisfield	rdcl	2210278	5580687	efp	nospec	
114163	4	2018	Amisfield	rdcl	2210879	5580397	efp	brown trout	33
15507	1	1996	Park Burn	doco	2211500	5578900	efp	brown trout	1
15508	1	1996	Park Burn tributary	doco	2211500	5579200	efp	brown trout	1
114079	4	2018	Park Burn tributary	rdcl	2210123	5579288	efp	brown trout	4

Table 2. Water Ways Consulting Ltd Data from Allibone (2019)

Site	Area fished (m^2)	Species and size
Breakneck Ck 1	80	brown trout (length 76-194mm)
Breakneck Ck 2	80	brown trout (length 63-209mm)
Amisfield Burn 1	100	No species
Park Burn 1	100	brown trout (length 219mm)
Park Burn 2	Nil	Nil
Park Burn 3	10	Nil
Park Burn 4	80	brown trout (length 67-80mm)
Park Burn 5	20	Nil
Park Burn 6	80	brown trout (length 77-97mm)
Park Burn 7	Nil	Nil
Park Burn 8	Nil	Nil
Park Burn 9	30	brown trout (length 78-205mm)
Park Burn 10	50	Nil
Park Burn 11	100	brown trout (length 104-151mm), rainbow trout (length 127mm)
Park Burn 12	80	Nil

Table 3. Summary of 7dMALFs to advise setting residual flows on retakes in Park Burn Tributary and Five Mile Creek Tributary, calculated with two different methods at three points.

				Method 1		Method 2	
Point	Waterway	Location	Area (km^2)	Yield at MALF ($l/s/km^2$)	7dMALF (l/s)	Yield at MALF ($l/s/km^2$)	7dMALF (l/s)
L1	Park Burn Tributary	Upstream of retake	7.237	9.533	69	4.078	29.5
L2	Five Mile Creek Tributary	Upstream of confluence	1.36	9.533	13	1.604	2.2
L3	Five Mile Creek	Upstream of retake	2.414	9.533	23	1.541	3.7

References

Allibone, R.A. (2019). Park Burn and Amisfield Burn Ecological Considerations for Residual Flows. Water Ways Consulting Ltd, report 78-2019 for Landpro Ltd.

Crow, S. (2017). New Zealand Freshwater Fish Database. Version 1.2. The National Institute of Water and Atmospheric Research (NIWA). Occurrence Dataset https://doi.org/10.15468/ms5iqu.

Dunn, N. R., Allibone, R.M., Closs, G.P., Crow, S.K., David, D.O., Goodman, J.M., Griffiths, M., Jack, D.C., Ling, N., Waters, J.M., Rolfe, J.R. (2018). Conservation status of New Zealand freshwater fish. New Zealand threat classification series 24. Wellington, Department of Conservation.

Jamieson, D., Bonnett, M., Jellyman, D., and Unwin, M. (2007). Fish Screening: good practice guidelines for Canterbury. NIWA Client Report CHC2007.092. NIWA, Christchurch.

Landpro (2019a). Hydrological assessment prepared for water users of the Amisfield Burn: Small Burn Limited, Pisa Holdings Limited, and Lowburn Land Holdings Limited. Technical comment.

Landpro (2019b). Hydrological assessment prepared for water users of the Park Burn: Smallburn Limited and Parkburn Water Company. Technical comment.

Appendix 1

Hydrological assessment of Pisa Range catchments

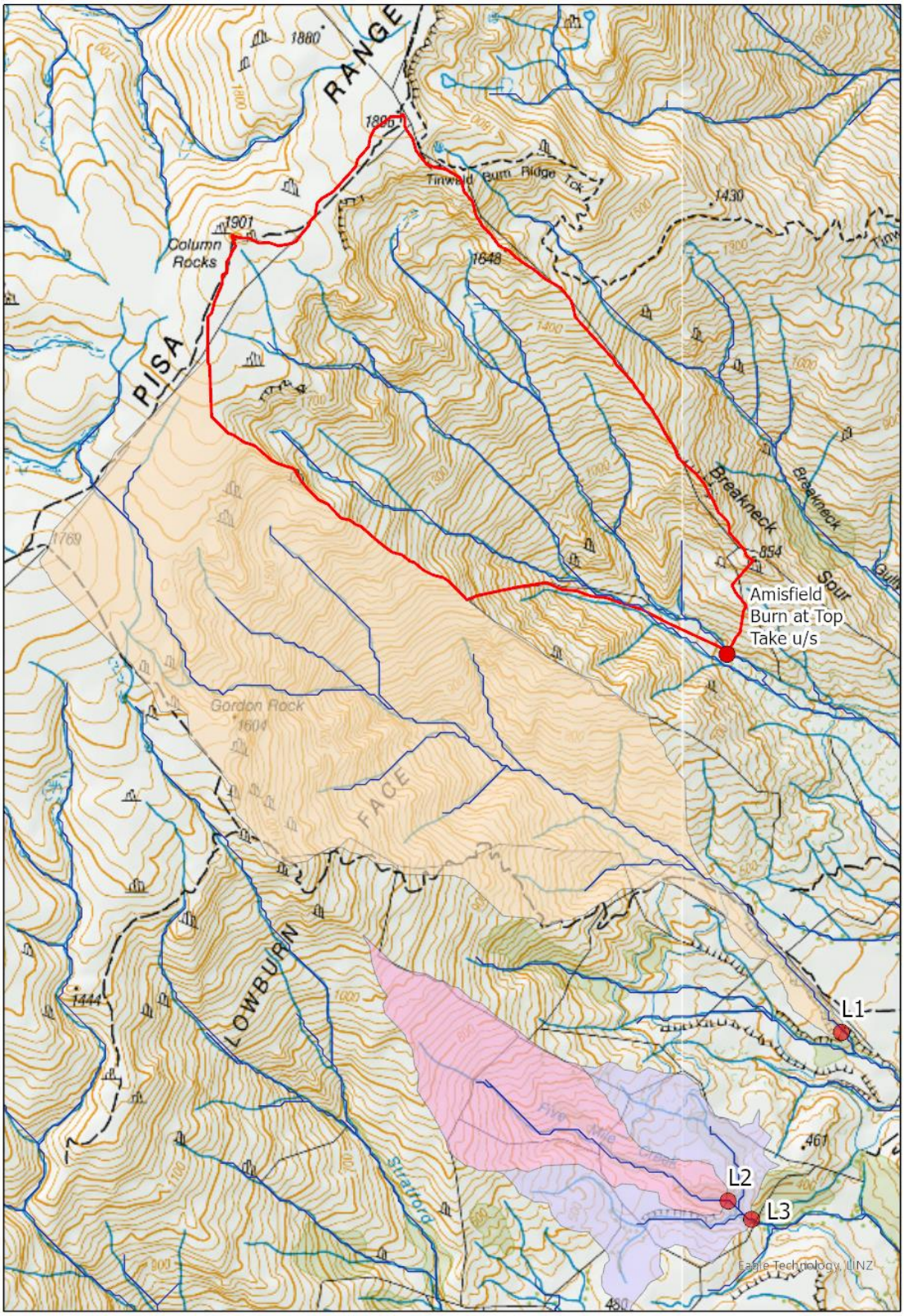
prepared by Xiaofeng Lu – ORC Hydrologist.

Target

Estimate the naturalised Seven-day Mean Annual Low Flow (7dMALF) values for the following locations L1 – L3 (see Map 1), and their locations are listed in Table 1:

Table 1. The key locations of interests

Point	*Waterway*	*Location*	*Easting*	*Northing*
L1	*Park Burn Tributary*	*Upstream of retake*	*1301008*	*5016581*
L2	*Five Mile Creek Tributary*	*Upstream of confluence*	*1300288*	*5015510*
L3	*Five Mile Creek*	*Upstream of retake*	*1300437*	*5015394*


RANGE
1880
1805
Tinwald Burn Ridge Trk
1430
1901
Column Rocks
1648
PISA
Breakneck
Breakneck Gully
Sour
854
Amisfield Burn at Top Take u/s
1769
Gordon Rock
1604
FACE
1444
L1
L2
L3
461
Stratford
Eagle Technology LINZ

Map 1. The locations of interests L1 – L3

Data

The data used for this task is the daily flow time series recorded at Amisfield Burn at Top Take upstream (31st Oct 2013 – 1st Jul 2020), which is natural and used as a reference for estimating the 7dMALF values for the key locations L1 – L3.

The average of the seven-day annual low flow (7dLF) each water year (Jul - Jun) calculated for this dataset is 54.7 (l/s), with six water years being involved in the calculations (Table 2).

Table 2. The 7dLF each water year for the recorder at Amisfield Burn at Top Take upstream

Start	*End*	*7dLF (l/s)*	*Gap (days)*	*Involved in the calculation*
31/10/2013	*30/06/2014*	*75.0*	*0*	*No*
1/07/2014	*30/06/2015*	*51.0*	*0*	*Yes*
1/07/2015	*30/06/2016*	*41.6*	*0*	*Yes*
1/07/2016	*30/06/2017*	*67.6*	*7*	*Yes*
1/07/2017	*30/06/2018*	*49.5*	*0*	*Yes*
1/07/2018	*30/06/2019*	*74.1*	*0*	*Yes*
1/07/2019	*30/06/2020*	*44.6*	*0*	*Yes*

Method I – assumption of consistent yield at MALF

*There are only **six** water years (Jul - Jun) used for estimating the 7dMALF for the recorder at Amisfield Burn Top Take upstream, and this relatively shorter flow records are NOT enough to calculate the 7dMALF. In this case, daily flow recorded at Lindis at Lindis Peak (assumed to be natural) is investigated by a simple regression analysis in order to extend the simulated flows at Amisfield recorder. However, the relationship is not good (Figure 1).*

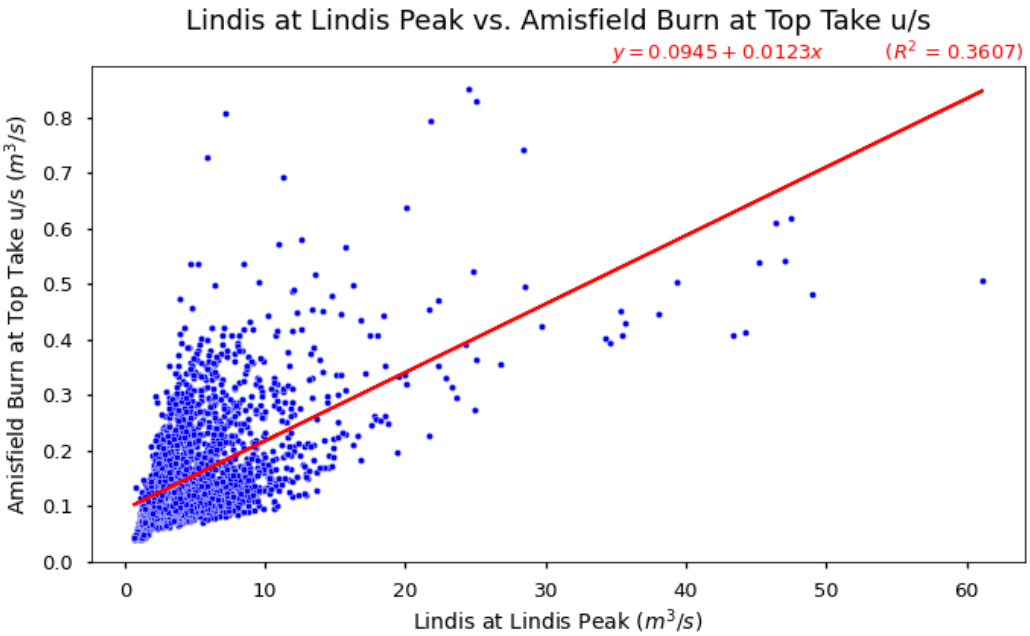


Figure 1. The simple regression analysis between Lindis at Lindis Peak and Amisfield flow recorders

*The question is how representative the estimated 7dMALF of 57.2 l/s calculated from the **six** water years of flow records? Check the nearby rainfall total each water year at Cromwell Electronic Weather Station (Agent No. 26381), presented by Standardised Precipitation Index (SPI) as shown in Figure 2:*

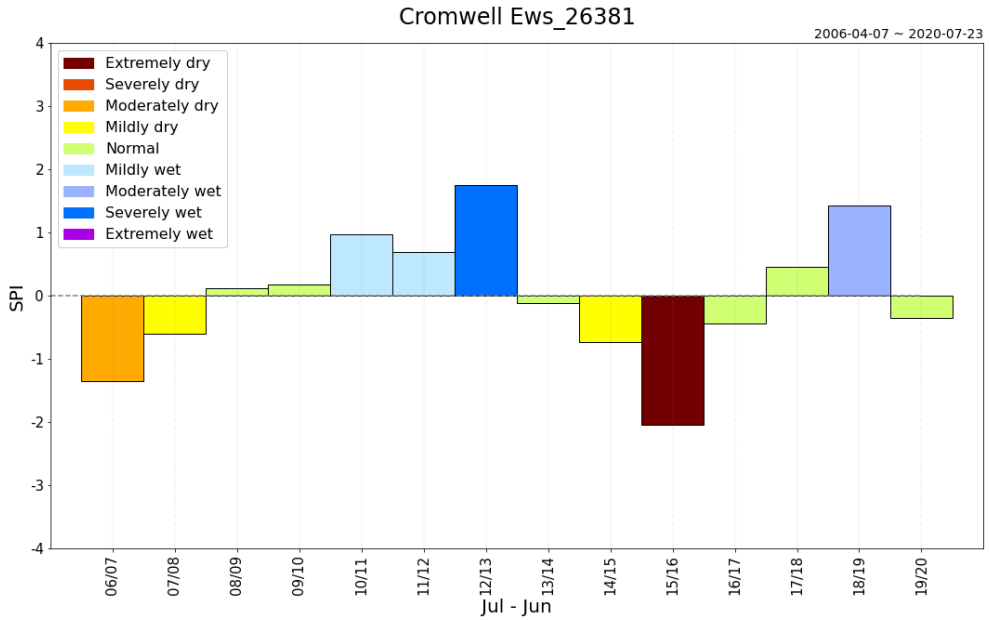


Figure 2. The SPI category each water year for the rain gauge at Cromwell EWS

The SPI category each water year at rain gauge at Cromwell Ews indicates that dry/normal/wet water years were captured from the water year 2013/14 to 2019/20, which has a similar trend for those 7dLF values for Amisfield

Burn flow recorder (Table 1). This might indicate that 57.2 l/s as the estimated 7dMALF for Amisfield Burn recorder might be OK to some degree (more flow data need to be collected to verify this).

Use the derived 7dMALF of 57.2 l/s as a reference to estimate the 7dMALF values for the key locations of L1 – L3. Assume that the catchment yield for the three upstream catchment areas above locations L1 – L3 is the same as that of the upstream area above the Amisfield Burn flow recorder, which is 57.2 l/s divided by the area of 6 km^2, calculated as 9.533 l/s/km^2. Applying this catchment yield at 7dMALF to the three upstream areas above locations L1 – L3 derives the naturalised 7dMALF values shown in Table 3.

Table 3. The estimated 7dMALF values for the area above locations L1 – L3 (by applying a consistent catchment yield at MALF to the upstream areas)

Point	*Waterway*	*Location*	*Area (km^2)*	*Yield at MALF (l/s/km^2)*	*7dMALF (l/s)*
L1	*Park Burn Tributary*	*Upstream of retake*	*7.237*	*9.533*	*69.0*
L2	*Five Mile Creek Tributary*	*Upstream of confluence*	*1.360*	*9.533*	*13.0*
L3	*Five Mile Creek*	*Upstream of retake*	*2.414*	*9.533*	*23.0*

Method II – NIWA's NZ river

NIWA's NZ river (Booker, 2010, 2013, 2014) models the natural river flow statistics, and predicts for all river reaches for New Zealand. The specific catchment yield at MALF can be obtained and applied to the corresponding upstream areas above the locations L1 – L3, which derives the long-term naturalised 7dMALF values for locations L1 – L3. The results are listed in Table 4:

Table 4. Naturalised 7dMALF estimated from NIWA's model

Point	*Waterway*	*Location*	*Area (km^2)*	*Yield at MALF (l/s/km^2)*	*7dMALF (l/s)*
L1	*Park Burn Tributary*	*Upstream of retake*	*7.237*	*4.078*	*29.5*
L2	*Five Mile Creek Tributary*	*Upstream of confluence*	*1.360*	*1.604*	*2.2*
L3	*Five Mile Creek*	*Upstream of retake*	*2.414*	*1.541*	*3.7*

Discussion

Lack of longer flow data for the reference site is the main issue. To derive the long-term flow statistics, it is suggested that at least 30-year continuous time series is needed (WMO, 2008). The SPI category used for indicating dry/normal/wet water years is purely rainfall total based, and it has no consideration of how rainfall events were distributed over a water year – it is just an indicator.

As for method I, the assumption of the catchment yield at MALF for all three areas above locations L1 – L3 is the same as that of the upstream area above Amisfield Burn recorder might not be the case in the real world. To have better understanding on the general flow regime for both Amisfield Burn and Five Mile Creek more data are needed to be collected in the future.

NIWA's model is a good tool for having a quick idea of possible river flow statistics for those reaches without any observed flows. Given the lack of ground truth (flow measurements) for Five Mile Creek and highly uncertainties in nature for hydrology, it is hard to verify how good it is.

References

WMO- No. 1029 (2008); Operational hydrology report (OHR)- No. 50

Booker, D.J. (2010) Predicting width in any river at any discharge. Earth Surface Processes and Landforms. 35, 828-841.

Booker, D.J., Hicks, D.M. (2013) Estimating wetted width and fish habitat areas across New Zealand's rivers. Report to Department of Conservation, CHC2013-075, 33pp.

Booker, D.J.; Woods, R.A. (2014) Comparing and combining physically-based and empirically-based approaches for estimating the hydrology of ungauged catchments. Journal of Hydrology DOI: 10.1016/j.jhydrol.2013.11.007.

Otago Regional Council

Analysis of Sarah McCorrie – ORC Systems and Data Analysis

Otago Regional Council

Document Id: **A1355395**

MEMORANDUM

To: **Kirstyn Lindsay**

From: **Sarah McCrorie**

Date: **11/06/2020**

Re: **RM20.007 - Amisfield Burn historical water use analysis**

This memorandum is in relation to application RM20007 to replace deemed permits 96320.V1 and 96321.V1 from Amisfield Burn for the purpose of irrigation and stock drinking. Abstraction of water under this permit occurs through water meter WM0964.

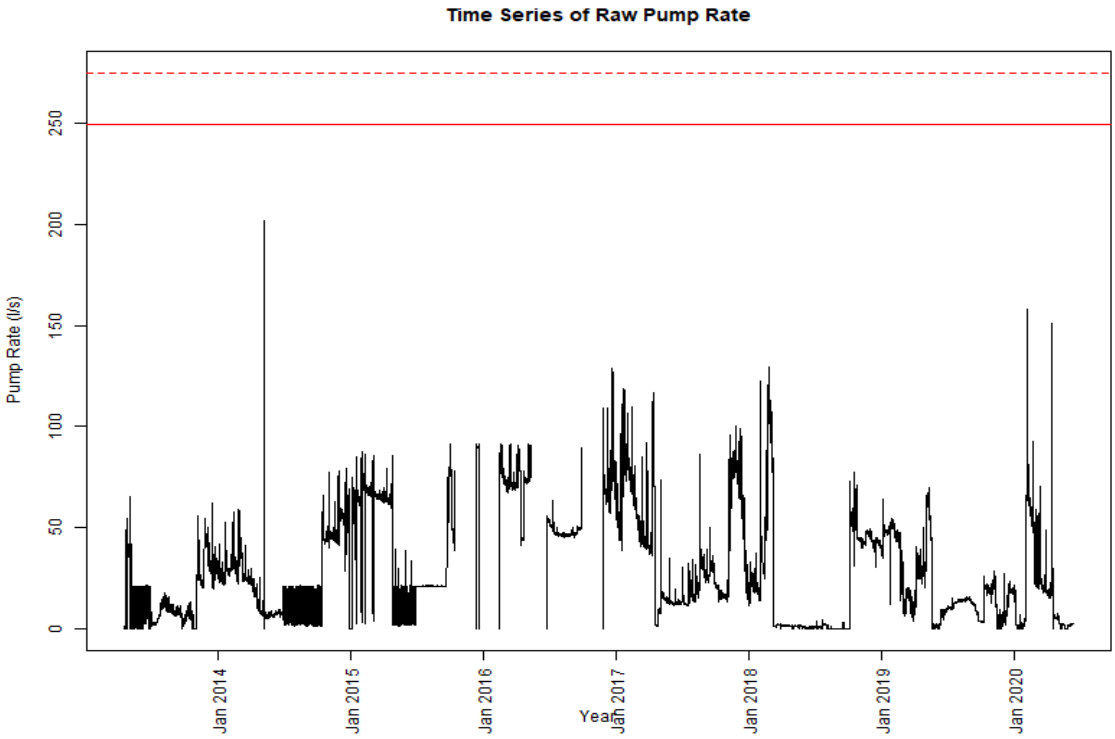
All analyses, graphs, and calculations were performed using RStudio version1.2.5033 and RGui version 3.6.3.

Data taken through WM0964 extends from 19 April 2013 to 10 June 2020 with a total of 57308 hourly measurements.

In addition to analysing the raw data, the following steps were taken:

- Rates less than, or equal to zero were set to NA.
- The maximum average rate of take authorized by the permit this application seeks to replace is 249.8 l/s and water is taken through an open channel. A 10% margin of error was applied to this and rates in excess of 274.78 l/s were set to NA.
- Rates between 249.8l/s and 274.78l/s were set to 249.8l/s.
- The resultant data set had 54383 hourly measurements

A time series showing the pump rate, the maximum consented rate, and the upper error limit is presented below:

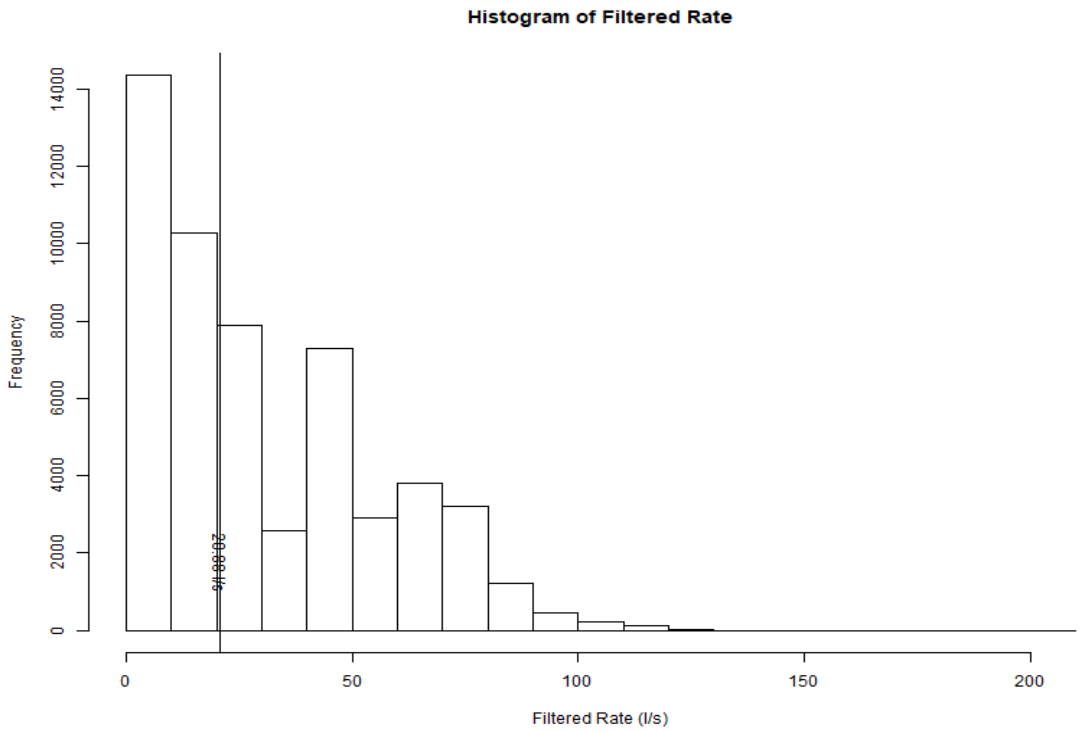


The solid red line represents the consented maximum rate of 249.8 l/s, and the broken red line represents 249.8 + 10% (274.78 l/s).

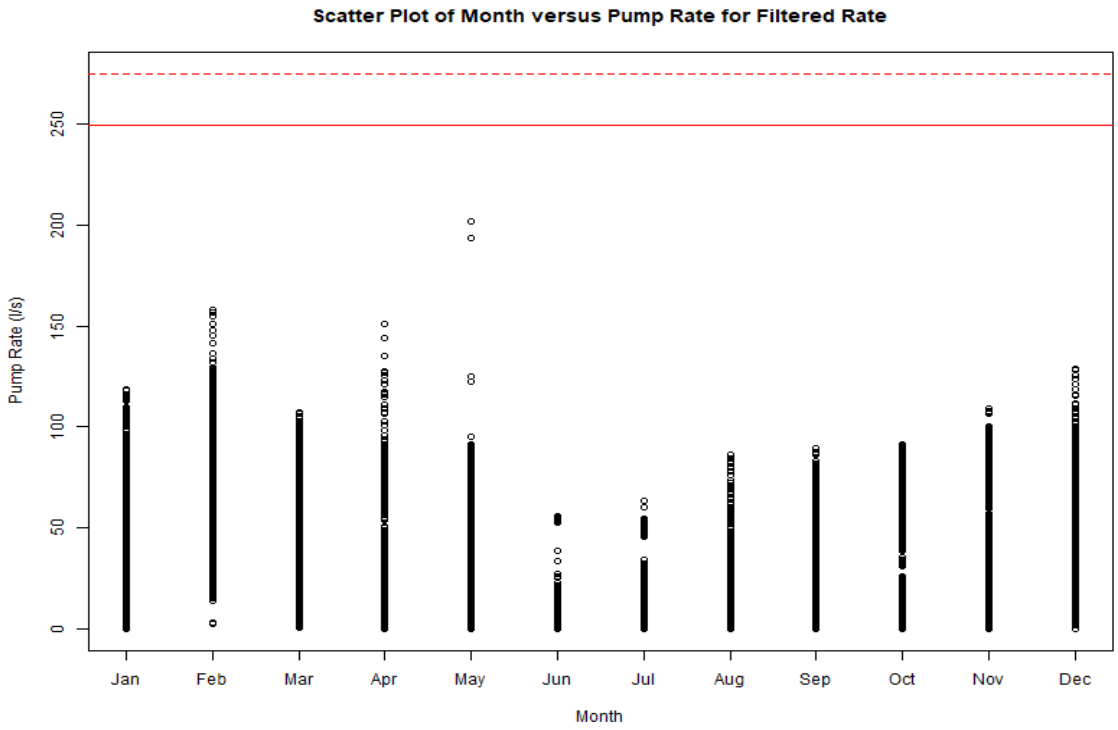
There is no consistent pattern distinguishable in the raw time series graph.

The filtered data set contains 54,383 measurements with an average take of 30.4 l/s, a median rate of take of 20.9 l/s, and a modal (most common) rate of take of 20.87 l/s.

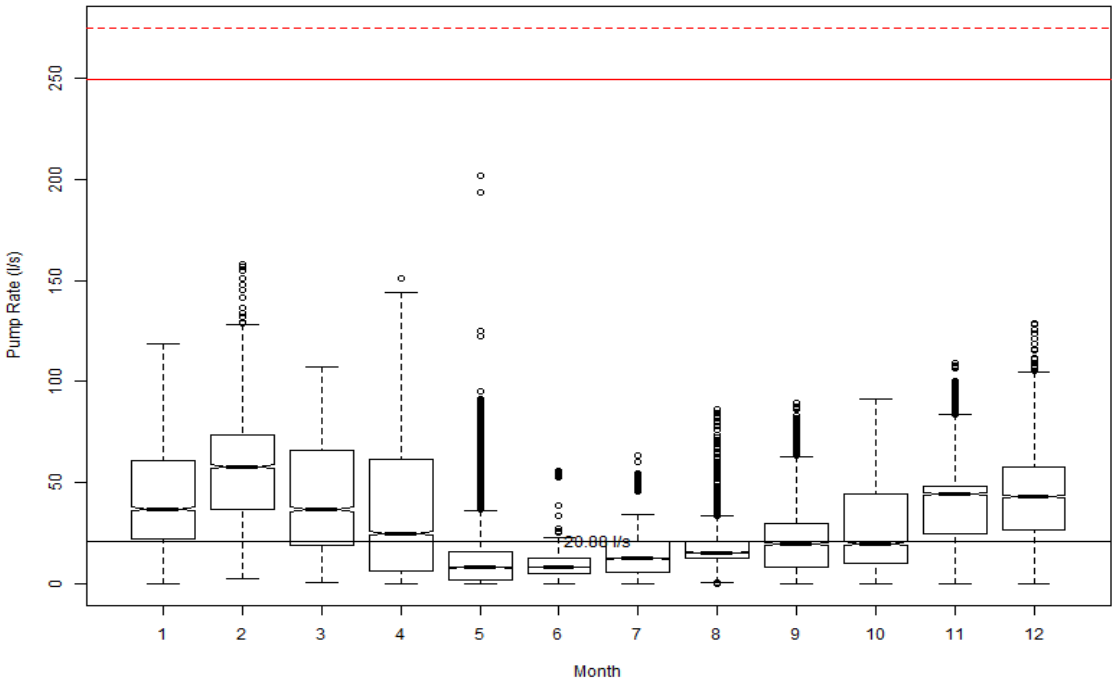
The histogram is positively skew with a bimodal element. There is a major peak at 0-10 l/s and a smaller peak at 40-50 l/s, this would be consistent with a lower rate of rate stock drinking most of the time and higher rate of take for irrigation some of the time.



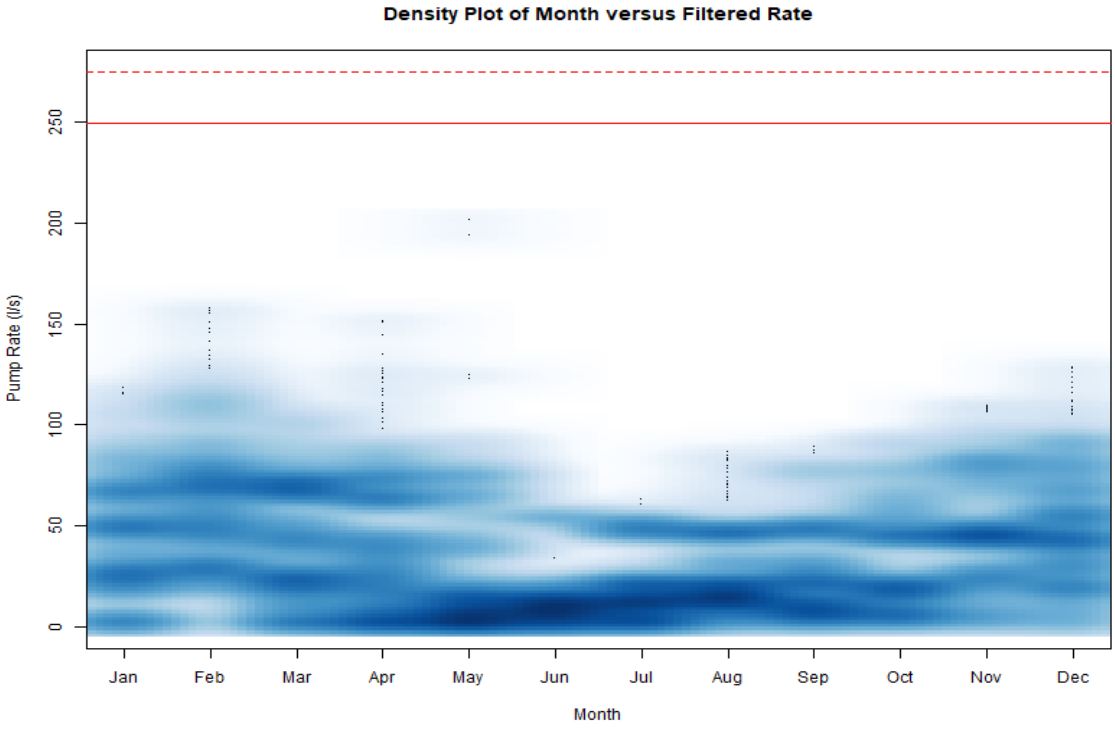
The scatter plot below shows higher rates of take are likely to occur between November and April, which is consistent with irrigation. The lower rates during the off-season are consistent with stock drinking.



It can be seen on the box plot below the rates of take are more likely to be above the average rate of take between November and April. This is consistent with irrigation.



The density plot supports the data from the box plot.



The high use data set was selected by filtering for those months in which the median usage exceeded the median for the filtered data set. The mean for the high use data set is 42.21/s, the median is 42.62 l/s and the modal value is 0.12 l/s.

Percentiles are not a percentage of the maximum rate, but rather the rate that is exceeded x% of the time. Percentiles are calculated by ranking the data from lowest to highest and taking the

weighted average of the nth highest and the n+1th highest values. The 80th percentile is the pump rate that is exceeded 20% of the time. The 90th percentile is the pumping rate that is exceeded 10% of the time. The 95th Percentile is exceeded 5% of the time. What this means in terms of the analysis is that if the applicant is pumping at the maximum consented rate more than 5% of the time, the 95th percentile will equal the maximum consented rate. If they are pumping at the maximum consented rate more than 10% of the time, the 90th percentile will equal the maximum consented rate. If they are pumping at the maximum consented rate more than 20% of the time, then the 80th percentile will equal the maximum consented rate. In practical terms if the applicant is pumping 24 hours/day and 2160 hours for a 90-day season then:

- The 80th percentile is the rate that is exceeded for 5 hours per day, or 432 hours per season.
- The 90th percentile is the rate that is exceeded for 2.5 hours per day, or 216 hours per season.
- The 95th percentile is the rate that is exceeded for 1.5 hours per day, or 108 hours per season.

What this means is that if a consent holder is consistently using their maximum consented rate for more than 5%, 10%, or 20% of the time they are pumping, it will show up in the table of percentiles.

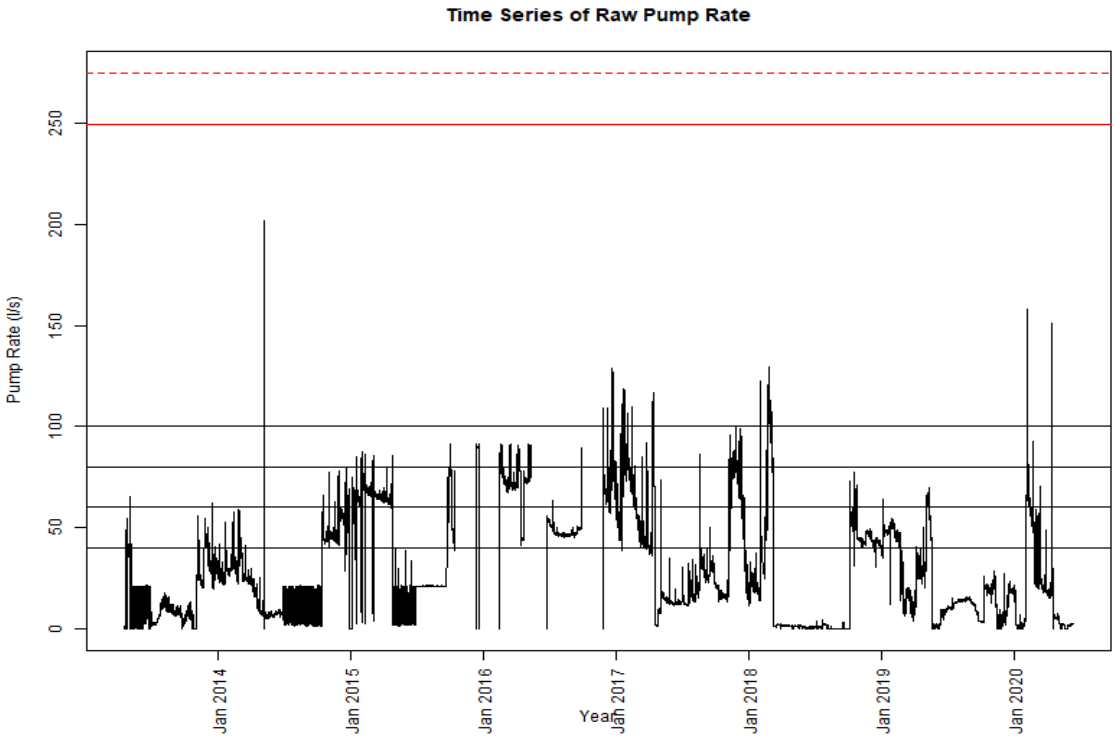
The 80th, 90th, and 95th percentiles for the flow rate were calculated, without modelling the distribution, for the raw data set, the filtered data set, and the high rate data set. The results are presented to three significant figures below.

	80th %ile	**90th %ile**	**95th %ile**
Raw rate	51.2	68.8	76.7
Filtered rate	52.8	69.6	77.3
High use rate	68	76.2	83.3

A summary of rates and volumes for the period 1 July 2012 to 30 June 2017, prepared according to proposed Method 10.A.4 is presented below:

	Max Take Rate	**Max Daily Volume**	**Max Monthly Volume**	**Max Annual Volume**
2012/2013	65.3	5080	57400	109000
2013/2014	202	4460	90200	541000
2014/2015	87.6	6680	176000	1090000
2015/2016	91	7840	193000	829000
2016/2017	129	9240	2e+05	1270000
Mean	115	6660	143000	767000

A time series with reference lines at 40 l/s, 60 l/s, 80 l/s, & 100 l/s is presented below to provide context for the percentiles and where they sit in relation to the history of taking by the resource consent holder.


Time Series of Raw Pump Rate
Pump Rate (l/s)
0
50
100
150
200
250
Jan 2014
Jan 2015
Jan 2016
Jan 2017
Jan 2018
Jan 2019
Jan 2020
Year

The number of days in each month of the historical record that the 80th, 90th, and 95th percentiles have been exceeded for all three data sets is presented below:

51.2 l/s	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	NA	NA	NA	1	2	0	0	0	0	0	4	1
2014	1	2	1	0	1	0	0	0	0	1	5	27
2015	27	28	31	28	0	0	0	0	6	10	NA	4
2016	NA	14	31	25	11	8	7	0	2	NA	6	31
2017	30	28	12	9	1	0	0	2	0	0	25	18
2018	0	17	9	0	0	0	0	0	0	22	0	0
2019	8	4	0	0	13	0	0	0	0	0	0	0
2020	1	24	3	2	0	0	NA	NA	NA	NA	NA	NA

68.8 l/s	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	NA	NA	NA	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	1	0	0	0	0	0	3	3
2015	11	24	6	7	0	0	0	0	5	9	NA	4
2016	NA	14	31	25	11	0	0	0	2	NA	6	28
2017	20	19	3	5	1	0	0	1	0	0	25	12
2018	0	12	9	0	0	0	0	0	0	6	0	0
2019	0	0	0	0	1	0	0	0	0	0	0	0
2020	0	8	1	2	0	0	NA	NA	NA	NA	NA	NA

76.7 l/s	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	NA	NA	NA	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	1	0	0	0	0	0	2	1
2015	4	6	3	3	0	0	0	0	4	8	NA	4
2016	NA	12	3	10	7	0	0	0	2	NA	4	18
2017	17	12	3	4	0	0	0	1	0	0	24	11
2018	0	12	7	0	0	0	0	0	0	1	0	0
2019	0	0	0	0	0	0	0	0	0	0	0	0

76.7 l/s	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2020	0	6	0	2	0	0	NA	NA	NA	NA	NA	NA

52.8 l/s	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	NA	NA	NA	1	2	0	0	0	0	0	3	1
2014	1	2	1	0	1	0	0	0	0	1	5	26
2015	27	28	31	28	0	0	0	0	6	10	NA	4
2016	NA	14	31	25	11	8	3	0	2	NA	6	31
2017	29	28	10	9	1	0	0	2	0	0	25	18
2018	0	17	9	0	0	0	0	0	0	21	0	0
2019	5	1	0	0	13	0	0	0	0	0	0	0
2020	1	23	3	2	0	0	NA	NA	NA	NA	NA	NA

69.6 l/s	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	NA	NA	NA	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	1	0	0	0	0	0	3	2
2015	9	20	5	7	0	0	0	0	5	9	NA	4
2016	NA	14	31	25	11	0	0	0	2	NA	6	25
2017	19	19	3	5	1	0	0	1	0	0	25	12
2018	0	12	8	0	0	0	0	0	0	5	0	0
2019	0	0	0	0	1	0	0	0	0	0	0	0
2020	0	8	1	2	0	0	NA	NA	NA	NA	NA	NA

77.3 l/s	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	NA	NA	NA	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	1	0	0	0	0	0	2	1
2015	4	4	3	3	0	0	0	0	4	8	NA	4
2016	NA	11	3	10	7	0	0	0	2	NA	4	18
2017	16	12	3	4	0	0	0	1	0	0	24	11
2018	0	12	7	0	0	0	0	0	0	0	0	0
2019	0	0	0	0	0	0	0	0	0	0	0	0

77.3 l/s	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2020	0	6	0	2	0	0	NA	NA	NA	NA	NA	NA

68 l/s	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	NA	NA	NA	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	1	0	0	0	0	0	3	3
2015	13	27	8	8	0	0	0	0	5	9	NA	4
2016	NA	14	31	25	11	0	0	0	2	NA	6	28
2017	20	20	4	5	1	0	0	1	0	0	25	12
2018	0	12	9	0	0	0	0	0	0	8	0	0
2019	0	0	0	0	2	0	0	0	0	0	0	0
2020	0	9	1	2	0	0	NA	NA	NA	NA	NA	NA

76.2 l/s	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	NA	NA	NA	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	1	0	0	0	0	0	2	1
2015	5	6	3	4	0	0	0	0	4	8	NA	4
2016	NA	12	4	11	7	0	0	0	2	NA	4	19
2017	17	14	3	4	0	0	0	1	0	0	24	11
2018	0	12	7	0	0	0	0	0	0	2	0	0
2019	0	0	0	0	0	0	0	0	0	0	0	0
2020	0	6	0	2	0	0	NA	NA	NA	NA	NA	NA

83.3 l/s	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	NA	NA	NA	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	1	0	0	0	0	0	0	0
2015	3	3	1	1	0	0	0	0	0	5	NA	4
2016	NA	6	2	5	6	0	0	0	1	NA	3	11
2017	10	6	3	3	0	0	0	1	0	0	12	9
2018	0	12	6	0	0	0	0	0	0	0	0	0
2019	0	0	0	0	0	0	0	0	0	0	0	0

83.3 l/s	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2020	0	4	0	2	0	0	NA	NA	NA	NA	NA	NA

A summary of daily volumes, in m³, filtered for a maximum daily take of 21600 m³ and then rounded to three significant figures is presented below:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Min	10.4	1480	85.1	20.4	2.1	4.62	24.6	4.92	0.9	44.6	26.1	10.4
Mean	3340	4960	3470	2760	1430	818	1400	1780	1870	2340	3590	3850
Median	3150	5010	3280	2240	751	727	1020	1270	1210	1680	3800	3750
80%	5660	6470	5980	5470	2020	1080	1800	2820	3100	3960	4460	5700
90%	5960	7500	6210	6260	4890	1170	4050	4000	4200	5170	6840	6790
95%	6750	8410	6460	6560	6020	1330	4360	4020	4280	5640	7070	7170
Max	9240	10300	9090	7860	6900	4700	4600	5690	6690	7840	8650	8960

A summary of monthly volumes based on daily volumes that have been filtered for a maximum daily take of 21600m³ and then rounded to three significant figures is presented below.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	NA	NA	NA	19800	57400	31800	11300	30500	17400	13100	63600	90200
2014	77200	73100	78700	45700	21300	18800	27200	26800	23000	69000	119000	132000
2015	142000	167000	176000	155000	24800	24900	54600	55900	78300	84700	NA	NA
2016	NA	83500	193000	179000	72200	28000	131000	124000	118000	NA	36500	2e+05
2017	184000	178000	131000	92800	41700	32900	40200	70800	74200	47200	169000	145000
2018	59700	150000	74400	3500	2800	1490	3010	965	121	129000	116000	115000
2019	126000	97400	34100	70500	83800	14400	30500	38200	24000	40200	27600	36100
2020	9270	149000	64400	40200	3860	1550	NA	NA	NA	NA	NA	NA

In summary:

- The seasonal pattern is consistent with irrigation.
- The pattern of taking indicates that water is also being taken for stock drinking water.
- The maximum volume taken in any day is 10,300 m^3
- The maximum volume taken in any month is 200,000 m^3.
- The maximum taken in any irrigation year is 1,269,900 m^3
- The applicant has applied for 97.3 l/s with a ±10% accuracy.
- The maximum average calculated in accordance with Method 10.A.4 is 115 l/s, which exceeds what the applicant has applied for.
- The lowest rate that can be taken and still in the range 97.3 l/s ±10% is 88.5 l/s which does not include any of the percentiles.

Document Id: **A1355380**

MEMORANDUM

To: **Kirstyn Lindsay**

From: **Sarah McCrorie**

Date: **11/06/2020**

Re: **RM20007 - Park Burn historical water use analysis**

This memorandum is in relation to application RM20.007 to replace deemed permit 94394 and consent RM15.007.01 from Park Burn for the purpose of irrigation and stock drinking. Abstraction of water under this permit occurs through water meter WM0952.

All analyses, graphs, and calculations were performed using RStudio version1.2.5033 and RGui version 3.6.3.

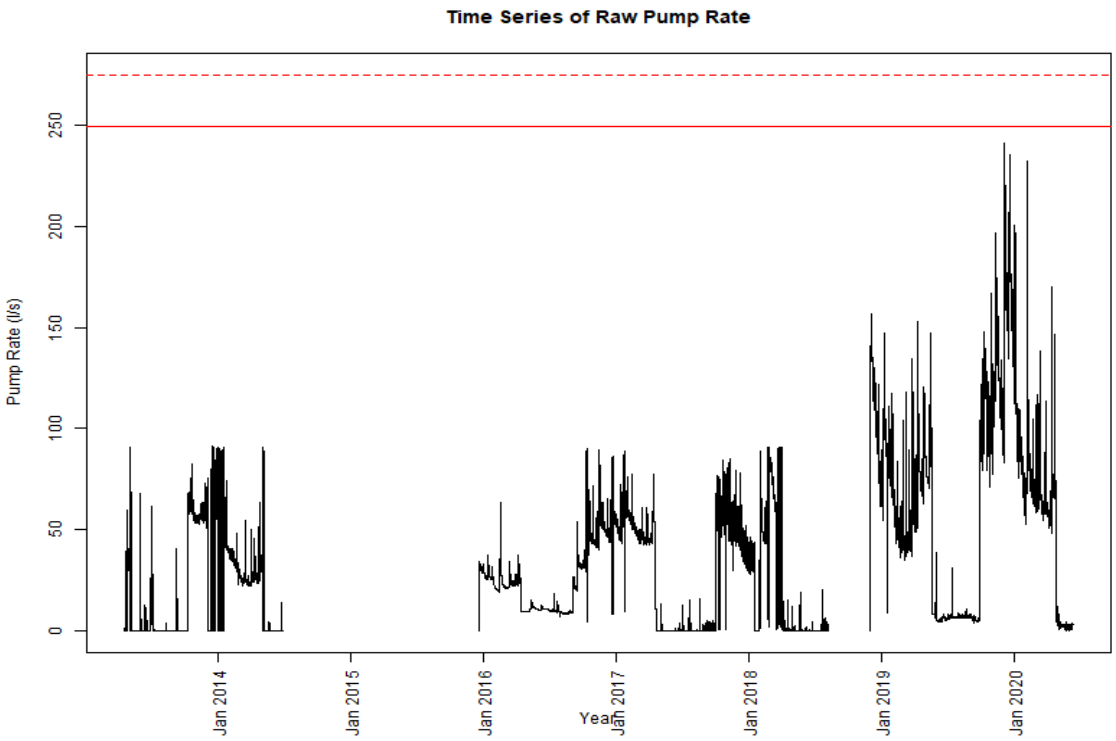
Data taken through WM0952 extends from 19 April 2013 to 10 June 2020 with a total of 46,863 hourly measurements.

The gap in the data from mid-2014 to the start of 2016 appears to be due to a faulty data logger which was replaced. The gap at the end of 2018 was a failure of the data logger it was reset.

In addition to analysing the raw data, the following steps were taken:

- Rates less than, or equal to zero were set to NA.
- The maximum average rate of take authorized by the permit this application seeks to replace is 249.8 l/s and water is taken through an open channel. A 10% margin of error was applied to this and rates in excess of 274.78 l/s were set to NA.
- Rates between 249.8l/s and 274.78l/s were set to 249.8l/s.
- The resultant data set had 38542 hourly measurements.

A time series showing the pump rate, the maximum consented rate, and the upper error limit is presented below:

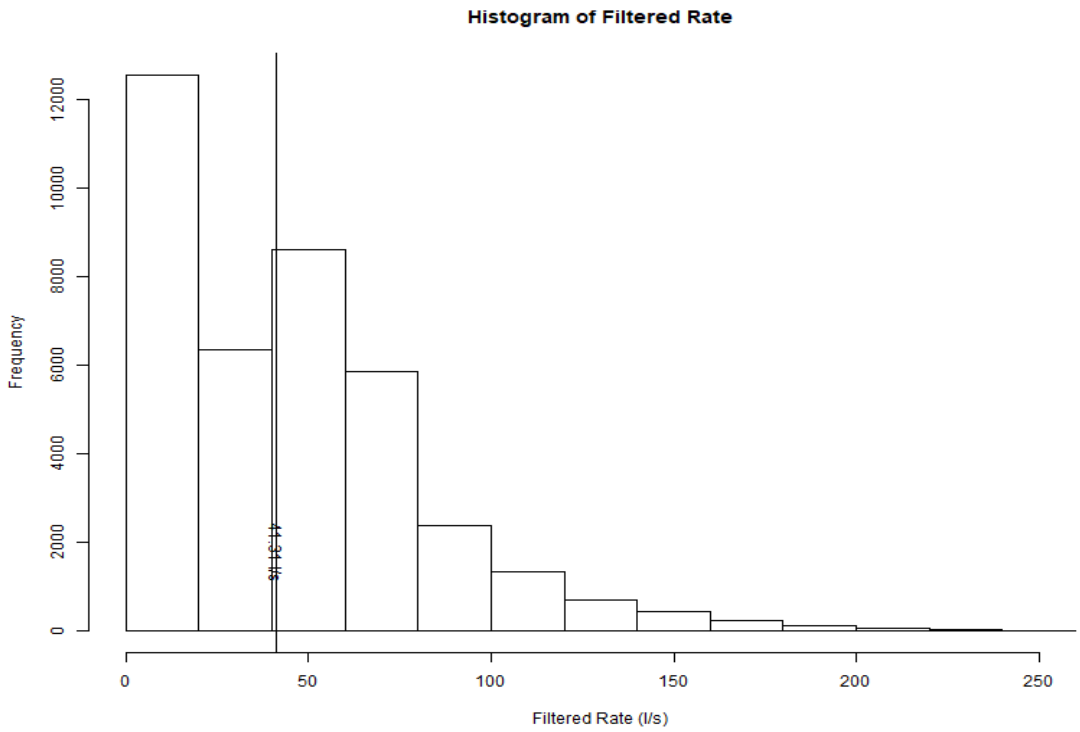


The solid red line represents the consented maximum rate of 249.8 l/s, and the broken red line represents 249.8 + 10% (274.78 l/s).

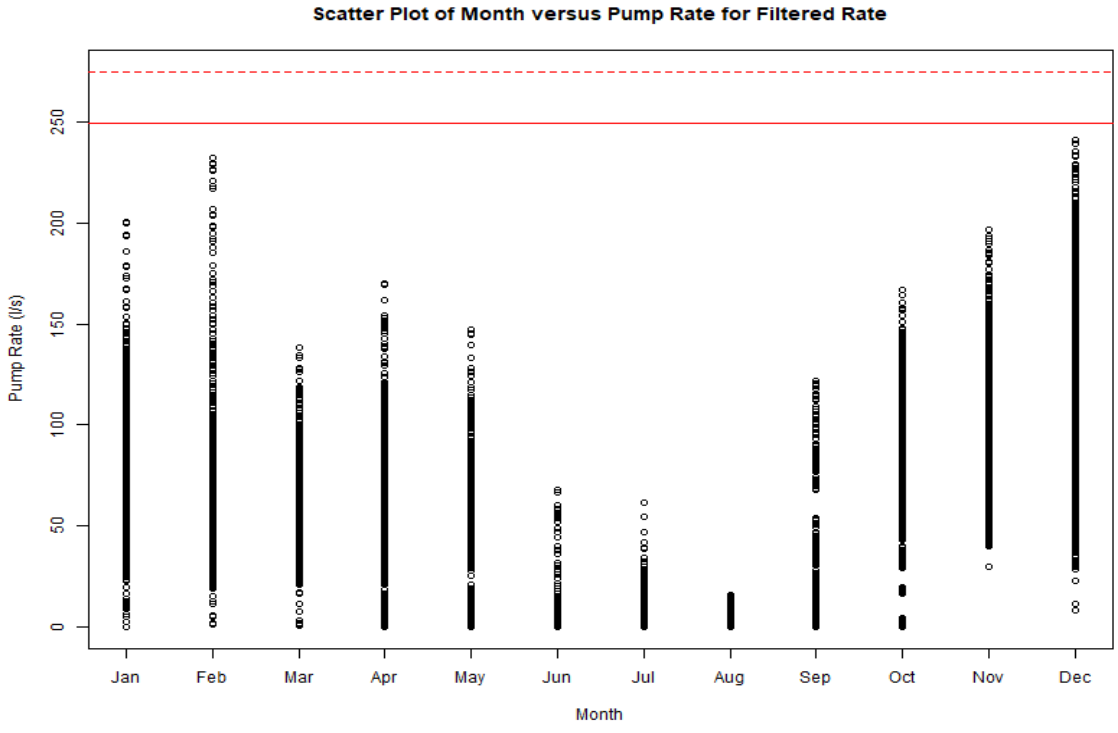
There is a pattern of seasonality visible in the raw time series graph. This would be consistent with irrigation. Rates of take have increased in the last couple of seasons.

The filtered data set contains 38,542 measurements with an average take of 43.2 l/s, a median rate of take of 41.3 l/s, and a modal (most common) rate of take of 0.01 l/s.

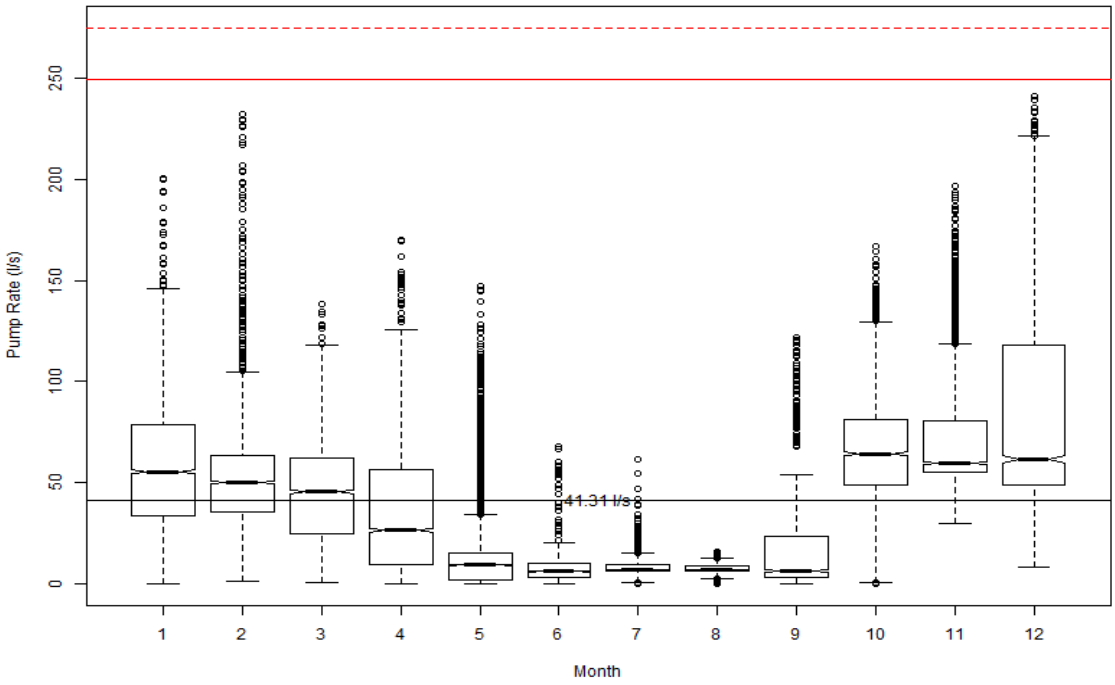
The histogram is slightly positively skewed but also a bimodal distribution with the highest peak at 0-20 l/s and a secondary peak at 40-60 l/s. This would be consistent with use for both stock drinking most of the time and irrigation during the season.



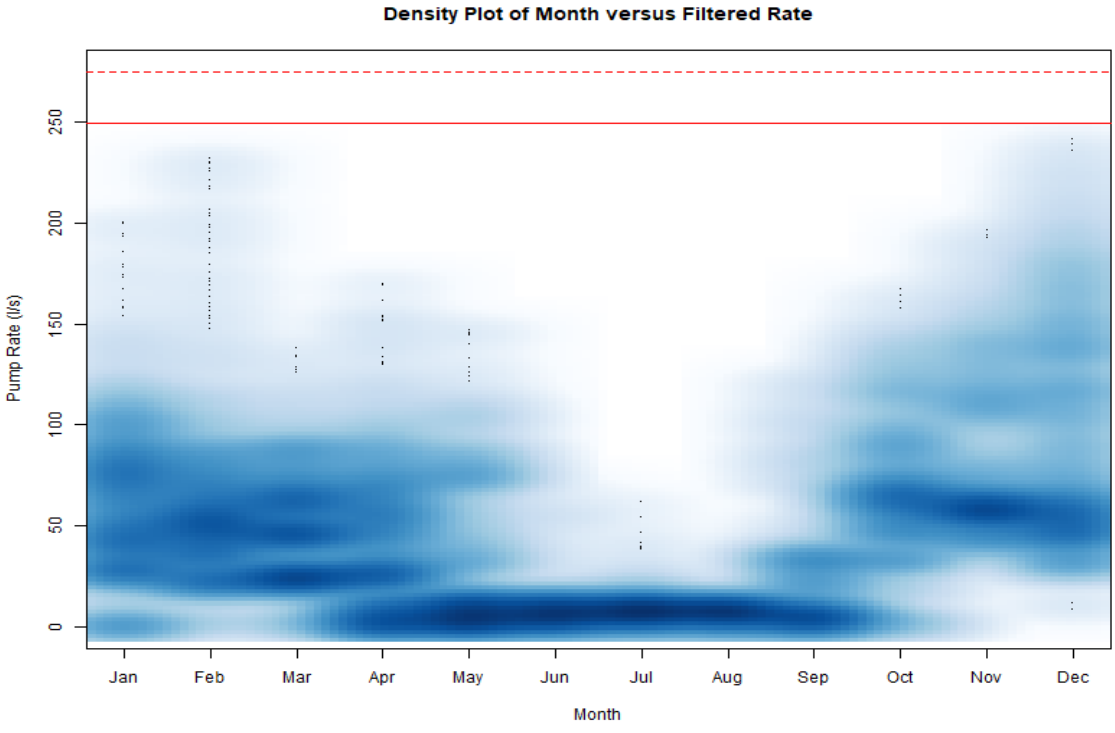
The scatter plot shows a strong seasonality, with higher rates likely to occur between September and May. The highest rates are likely to occur between November and February



The box plot supports the conclusions drawn from the scatter plot, the rate of take is likely to be above the average rate of take during October to March, this would be consistent with irrigation. The lower rates during the off-season would be consistent with stock drinking.



The density plot supports the data shown on the box plot.



The high use data set was selected by filtering for those months in which the median usage exceeded the median for the filtered data set. The mean for the high use data set is 61.6l/s, the median is 56.48 l/s and the modal value is 28.72 l/s.

Percentiles are not a percentage of the maximum rate, but rather the rate that is exceeded x% of the time. Percentiles are calculated by ranking the data from lowest to highest and taking the weighted average of the nth highest and the n+1th highest values. The 80th percentile is the pump rate that is exceeded 20% of the time. The 90th percentile is the pumping rate that is exceeded 10% of the time. The 95th Percentile is exceeded 5% of the time. What this means in terms of the analysis is that if the applicant is pumping at the maximum consented rate more than 5% of the time, the 95th percentile will equal the maximum consented rate. If they are pumping at the maximum consented rate more than 10% of the time, the 90th percentile will equal the maximum consented rate. If they are pumping at the maximum consented rate more than 20% of the time, then the 80th percentile will equal the maximum consented rate. In practical terms if the applicant is pumping 24 hours/day and 2160 hours for a 90-day season then:

- The 80th percentile is the rate that is exceeded for 5 hours per day, or 432 hours per season.
- The 90th percentile is the rate that is exceeded for 2.5 hours per day, or 216 hours per season.
- The 95th percentile is the rate that is exceeded for 1.5 hours per day, or 108 hours per season.

What this means is that if a consent holder is consistently using their maximum consented rate for more than 5%, 10%, or 20% of the time they are pumping, it will show up in the table of percentiles.

The 80th, 90th, and 95th percentiles for the flow rate were calculated, without modelling the distribution, for the raw data set, the filtered data set, and the high rate data set. The results are presented to three significant figures below.

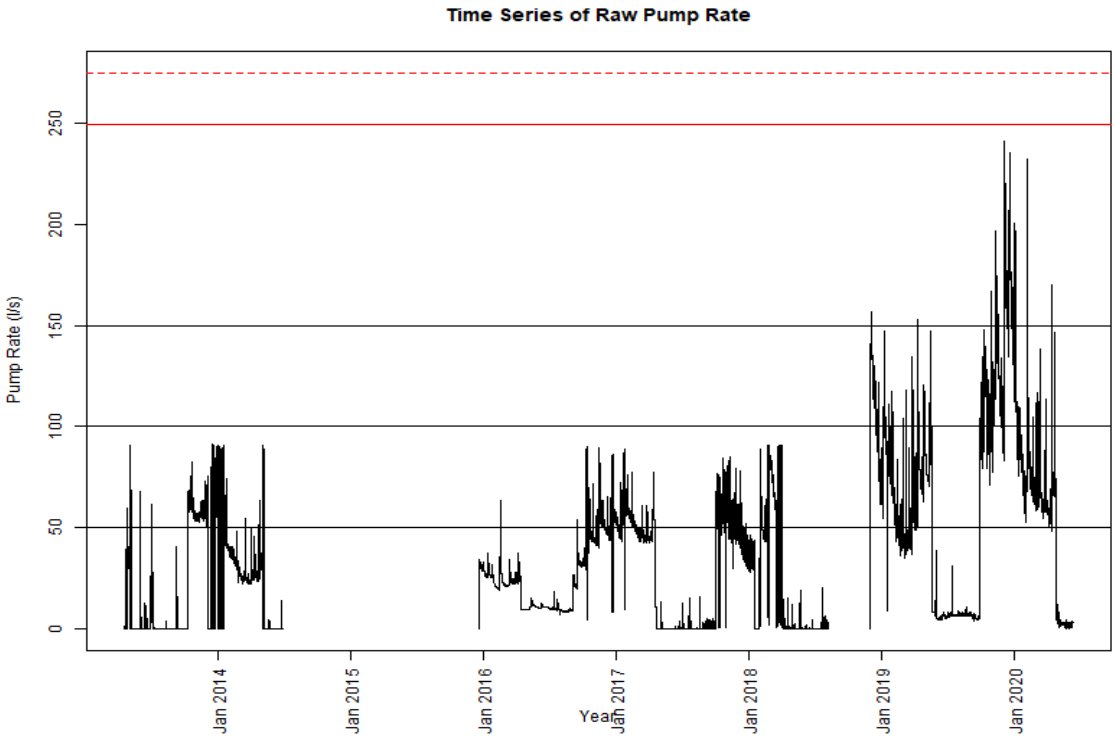
	80th %ile	**90th %ile**	**95th %ile**
Raw rate	64	83.3	107
Filtered rate	69	88.2	114
High use rate	81.4	107	132

A summary of rates and volumes for the period 1 July 2012 to 30 June 2017, prepared according to proposed Method 10.A.4 is presented below:

V1	**Max Take Rate**	**Max Daily Volume**	**Max Monthly Volume**	**Max Annual Volume**
2012/2013	90.9	6030	37200	62300
2013/2014	91.1	7120	158000	759000
2014/2015	NA	NA	NA	NA
2015/2016	63.4	5470	75300	324000
2016/2017	90.2	6620	151000	1010000
Mean	83.9	6310	105375	538825

The rate of take has increased since 2018, this should be considered.

A time series with reference lines at 50 l/s, 100 l/s, & 150 l/s is presented below to provide context for the percentiles and where they sit in relation to the history of taking by the resource consent holder.


Time Series of Raw Pump Rate
Pump Rate (l/s)
0
50
100
150
200
250
Jan 2014
Jan 2015
Jan 2016
Jan 2017
Jan 2018
Jan 2019
Jan 2020
Year

The number of days in each month of the historical record that the 80th, 90th, and 95th percentiles have been exceeded for all three data sets is presented below:

64 l/s	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	NA	NA	NA	0	4	1	0	0	0	10	3	14
2014	21	0	0	0	4	0	NA	NA	NA	NA	NA	NA
2015	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
2016	0	0	0	0	0	0	0	0	0	5	5	8
2017	11	3	0	2	0	0	0	0	0	28	15	1
2018	0	13	24	3	0	0	0	0	NA	NA	NA	31
2019	31	8	8	25	17	0	0	0	5	31	30	31
2020	31	29	27	14	0	0	NA	NA	NA	NA	NA	NA

83.3 l/s	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	NA	NA	NA	0	2	0	0	0	0	0	0	6
2014	10	0	0	0	3	0	NA	NA	NA	NA	NA	NA
2015	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
2016	0	0	0	0	0	0	0	0	0	2	2	1
2017	3	0	0	0	0	0	0	0	0	1	2	0
2018	0	10	12	3	0	0	0	0	NA	NA	NA	26
2019	22	3	5	13	8	0	0	0	4	30	30	31
2020	23	13	8	4	0	0	NA	NA	NA	NA	NA	NA

107 l/s	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	NA	NA	NA	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	NA	NA	NA	NA	NA	NA
2015	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
2016	0	0	0	0	0	0	0	0	0	0	0	0
2017	0	0	0	0	0	0	0	0	0	0	0	0
2018	0	0	0	0	0	0	0	0	NA	NA	NA	20
2019	5	1	3	3	4	0	0	0	2	18	28	31

107 l/s	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2020	8	6	5	3	0	0	NA	NA	NA	NA	NA	NA

69 l/s	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	NA	NA	NA	0	2	0	0	0	0	2	1	12
2014	19	0	0	0	4	0	NA	NA	NA	NA	NA	NA
2015	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
2016	0	0	0	0	0	0	0	0	0	4	4	2
2017	8	2	0	1	0	0	0	0	0	20	10	1
2018	0	12	20	3	0	0	0	0	NA	NA	NA	31
2019	31	5	8	20	17	0	0	0	5	31	30	31
2020	30	28	14	13	0	0	NA	NA	NA	NA	NA	NA

88.2 l/s	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	NA	NA	NA	0	1	0	0	0	0	0	0	5
2014	7	0	0	0	2	0	NA	NA	NA	NA	NA	NA
2015	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
2016	0	0	0	0	0	0	0	0	0	1	1	0
2017	1	0	0	0	0	0	0	0	0	0	0	0
2018	0	8	10	0	0	0	0	0	NA	NA	NA	24
2019	18	2	5	8	6	0	0	0	3	28	29	31
2020	20	11	7	3	0	0	NA	NA	NA	NA	NA	NA

114 l/s	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	NA	NA	NA	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	NA	NA	NA	NA	NA	NA
2015	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
2016	0	0	0	0	0	0	0	0	0	0	0	0
2017	0	0	0	0	0	0	0	0	0	0	0	0
2018	0	0	0	0	0	0	0	0	NA	NA	NA	15
2019	3	0	2	3	2	0	0	0	2	15	26	30

114 l/s	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2020	5	4	2	3	0	0	NA	NA	NA	NA	NA	NA

81.4 l/s	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	NA	NA	NA	0	2	0	0	0	0	1	0	6
2014	10	0	0	0	3	0	NA	NA	NA	NA	NA	NA
2015	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
2016	0	0	0	0	0	0	0	0	0	2	3	1
2017	3	0	0	0	0	0	0	0	0	1	2	0
2018	0	10	15	3	0	0	0	0	NA	NA	NA	28
2019	22	3	6	13	8	0	0	0	4	30	30	31
2020	24	13	8	4	0	0	NA	NA	NA	NA	NA	NA

107 l/s	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	NA	NA	NA	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	NA	NA	NA	NA	NA	NA
2015	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
2016	0	0	0	0	0	0	0	0	0	0	0	0
2017	0	0	0	0	0	0	0	0	0	0	0	0
2018	0	0	0	0	0	0	0	0	NA	NA	NA	19
2019	4	1	3	3	4	0	0	0	2	18	28	31
2020	8	5	5	3	0	0	NA	NA	NA	NA	NA	NA

132 l/s	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	NA	NA	NA	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	NA	NA	NA	NA	NA	NA
2015	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0
2016	0	0	0	0	0	0	0	0	0	0	0	0
2017	0	0	0	0	0	0	0	0	0	0	0	0
2018	0	0	0	0	0	0	0	0	NA	NA	NA	5
2019	1	0	1	2	1	0	0	0	0	7	12	27

132 l/s	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2020	3	3	1	3	0	0	NA	NA	NA	NA	NA	NA

A summary of daily volumes, in m³, filtered for a maximum daily take of 21600 m³ and then rounded to three significant figures is presented below:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Min	2.41	1100	53.3	0.5	0.1	0.1	0.1	0.13	1.26	59.8	3550	410
Mean	4950	4440	4060	3020	1400	374	445	451	1200	5650	6330	7100
Median	4690	4340	3950	2290	331	248	528	593	503	5500	5130	5190
80%	7120	5880	5620	5330	2500	877	820	743	2320	7690	9370	11700
90%	8250	6610	6630	6330	5750	911	855	776	2790	9060	10600	13700
95%	8940	7250	7110	7200	6760	940	905	795	3160	10600	12300	15200
Max	13800	15100	8330	10200	9600	2610	2340	844	8390	11900	15300	17700

A summary of monthly volumes based on daily volumes that have been filtered for a maximum daily take of 21600m³ and then rounded to three significant figures is presented below.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	NA	NA	NA	17100	37200	7950	8020	25.7	2250	106000	149000	76900
2014	158000	86100	68200	71200	33500	146	NA	NA	NA	NA	NA	NA
2015	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	24400
2016	75300	61800	60700	45000	29300	27500	26300	23600	68500	117000	133000	144000
2017	151000	133000	126000	84500	1930	434	3980	1680	3860	149000	162000	129000
2018	64900	132000	178000	28500	2760	256	2650	738	NA	NA	NA	272000
2019	222000	132000	139000	189000	137000	13900	17800	18600	37200	277000	316000	419000
2020	250000	210000	183000	138000	6410	2170	NA	NA	NA	NA	NA	NA

In summary:

- The seasonal pattern is consistent with irrigation.
- The pattern of taking indicates that water is also being taken for stock drinking water.
- The maximum volume taken in any day is 17,700 m^3
- The maximum volume taken in any month is 419,000 m^3.
- The maximum taken in any irrigation year is 1,875,180 m^3
- The applicant has applied for 120 l/s with a ±10% accuracy.
- The lowest rate at which water can be taken and still be in the range 120 l/s ±10% is 108 l/s.
- Historic data indicates that actual average maximum water use for the period 1 July 2012 to 30 June 2017 is 83.9 l/s.
- The highest rate at which water can be taken and still be in the range 83.9 l/s ±10% is 92.3 l/s.
- These ranges do not overlap and are therefore they cannot be considered 'The Same'.

Otago Regional Council