Lindis Catchment Group Ltd

Replacement of permits to take and use surface water

Resource Consent Application and Supporting Information

Prepared by McKeague Consultancy

15 November 2017

Quality Assurance Statement for: **McKeague Consultancy Ltd | 16 Howard Street | Macandrew Bay| Dunedin 9014**	
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Reviewed by	Susie McKeague
Approved for issue by	Susie McKeague and LCG

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Figures

Please note: all maps, unless stated otherwise are sourced from Google Maps or Google Earth Pro

Tables

Abbreviations used throughout this document

Abbreviation	
KTKO	Kāi Tahu ki Otago (now known as Aukaha)
LCG	Lindis Catchment Group Inc Society
LIC	Lindis Irrigation Company Ltd
MALF	Mean Annual Low Flow
MRAPA	Map Reference at Point of Abstraction
NPSFM	National Policy Statement for Freshwater Management 2014
NPSREG	National Policy Statement for Renewable Energy Generation 2011
PC5A	Plan Change 5A
PRPS	Proposed Regional Policy Statement
ORC	Otago regional Council
TWL	Tarras Water Limited
RMA	Resource Management Act
RPS	Regional Policy Statement
RPW	Region Plan: Water for Otago

Note that either L/sec or m^3 are used throughout this document (1000 L/sec = $1m^3$)

Part One: Resource Consent Application Forms

Form 9 of the Resource Management Act

Application for Resource Consent under Section 88 of the Resource Management Act 1991.

To: Otago Regional Council
Private Bag 1954
Dunedin

Applicant: Lindis Catchment Group Incorporated Society
Address: 135 Morris Road
RD2
Wanaka 9382
Contact: Graeme Martin, Chairperson
Email: gnmartin@xtra.co.nz

Consultant: Sally Dicey
Environmental Planner
McKeague Consultancy
sally@mckconsultancy.co.nz

The applicant applies for the resource consents described below:

* **Water permits to take and use surface water**
* **Land use consent to construct bores**
* **Water permits to take and use groundwater (connected to surface water)**
* **Water permits to take and use groundwater**
* **Transfer of interest in permits, including 'owner' of permit and location of permit**

1 The names and addresses of the owner and occupier which this application relates are:

Various as described in Table 2 of the Supporting Information and in Section 13 of the Supporting Information

2 The location of the proposed activity is:

Grid reference:
Various as described in Section 13 of the Supporting Information

GPS Location:
Various as described in Section 13 of the Supporting Information

Legal description of land adjacent to point of take:

Various as described in Section 13 of the Supporting Information

Legal Description of land where water will be used:

Various as described in Section 13 of the Supporting Information

3 A description of the activities to which the application relates is:

The construction of bores and the establishment of a new surface water intake.

The take and use of surface water, groundwater (connected to surface water) and groundwater for the purpose of irrigation, storage, domestic use, stock drinking water and hydro-electricity generation.

4 The following additional resource consents are required in relation to this proposal and have or have not been applied for:

No others are required.

5 Assessment of environmental effects

Attached in accordance with the Fourth Schedule of the Resource Management Act 1991, is an assessment of environmental effects in the detail that corresponds with the scale and significance of the effects that the proposed activity may have on the environment in accordance with Section 88 of, and the Fourth Schedule to, the Act.

6 Further Information

Attached is information (if any), required to be included in the application by the district plan, regional plan, the Resource Management Act 1991, or any regulations made under the Act or regulations.

By signing this form the signatory is:

a) agreeing to pay all actual and reasonable application processing costs incurred by the Otago Regional Council and,
b) stating that the information given in the application is true and correct to the best of his/her knowledge and belief.

……..

Signature of applicant or person authorised to sign on behalf of applicant

15 November 2017

……..

Date

Address for Service:

McKeague Consultancy
Attention: Sally Dicey
Resource Management Planner
Email: sally@mckconsultancy.co.nz
Postal: PO Box 1320
Dunedin 9054
Telephone No: 03 477 9242
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Application Forms of the Otago Regional Council

The information required by Form 1, 4, 5, 9A, 16 of the Otago Regional Council is included in Form 9 above and the supporting information and assessment of environmental effects following.

Executive Summary

This application seeks to replace permits to take and use water in the Lindis catchment. This application is made on the basis of a summer minimum flow of 550 L/sec being set at the ORC's Ardgour Road flow site. The proposal includes the disestablishment of 4 large race intakes and replacing only a portion of the water currently abstracted via these races with shallow bores in the Lindis Ribbon Aquifer. This proposal will significantly enhance flows in the reaches of the Lindis River currently most affected by abstraction.

In summary the key components of this proposal are:

- Replacement of permits to take and use surface water
- Summer minimum flow of 550 L/sec
- Dis-establishment of 4 large open race intakes
- Establishment of shallow bores in Lindis Ribbon Aquifer to replace a portion of the allocation currently taken via these races
- Greater reduction in allocation than if minimum flow was set at 900 L/sec

Any reference to this proposal includes all of these aspects. All references to the minimum flow in this document are references to the summer minimum flow.

The applicant's proposal to disestablish the large races and reduce abstraction from the Lindis River is only possible under a minimum flow of 550 L/sec. A minimum flow of greater than 550 L/sec will result in a reliability of supply of irrigation water that is too low to enable effective use of the efficient irrigation infrastructure already in place and expenditure on the significant changes to irrigation infrastructure that will be required if the races are disestablished.

Accordingly the applicant has requested that this application is publicly notified and directly referred to the Environment Court so that it can be assessed in concert with the applicant's appeal against the ORC decision to set a summer minimum flow of 900 L/sec at the Ardgour Road flow site.

This application seeks to replace 26 permits to take and use water (surface and groundwater) in the Lindis catchment and will result in very significant reduction in abstraction of primary allocation water from the Lindis catchment, as shown in Table 1 below.

Table 1: Overview of consented, existing, and proposed allocation Limits

Allocation Existing and Proposed	
Instantaneous Rate of Abstraction	L/sec
Existing consented total instantaneous rate of abstraction	4005
Existing total recorded maximum instantaneous rate of abstraction (based on monitoring data) of primary allocation water taken from within the Lindis catchment	3,258

Proposed total maximum instantaneous rate of abstraction of primary allocation water taken and used within the Lindis catchment (under 550 L/sec min flow)	1,688
Proposed total maximum instantaneous rate of abstraction of primary allocation water taken and used within the Lindis catchment (under 900 L/sec min flow)	3,258
Annual Volume	m^3
Existing total consented annual volume for all primary allocation permits being replaced in this application	95,846,500
Existing total recorded annual volume for primary allocation permits being replaced by this application (based on maximum recorded annual volumes)	42,896,509
Proposed annual volume (under 550 L/sec min flow) of primary allocation water taken and used within the Lindis catchment	18,969,508
Proposed annual volume (under 900 L/sec min flow) of primary allocation water taken within the Lindis catchment and used both within and outside of the Lindis catchment	33,039,187
LIC Annual Allocation Only	m^3
Existing total recorded annual volume for LIC primary allocation permits only	26,445,544
Proposed annual volume (under 550 L/sec min flow) of LIC primary allocation only water taken and used within the Lindis catchment	6,180,321
Proposed annual volume (under 900 L/sec min flow) of primary allocation water taken within the Lindis catchment and used both within and outside of the Lindis catchment	20,250,000

Decommissioning and redistributing four large race intakes to smaller shallow bore takes will reduce the maximum instantaneous rate of take for the Lindis **main-stem** from 2893 L/sec to 1326 L/sec. Land that was previously irrigated outside of the Lindis Catchment by two of these races will either revert to dryland or be irrigated from alternative sources (Clutha River or Bendigo Aquifer). This is shown in Figure 1 below. The new irrigated area shown in this figure includes areas irrigated with supplementary allocation water.

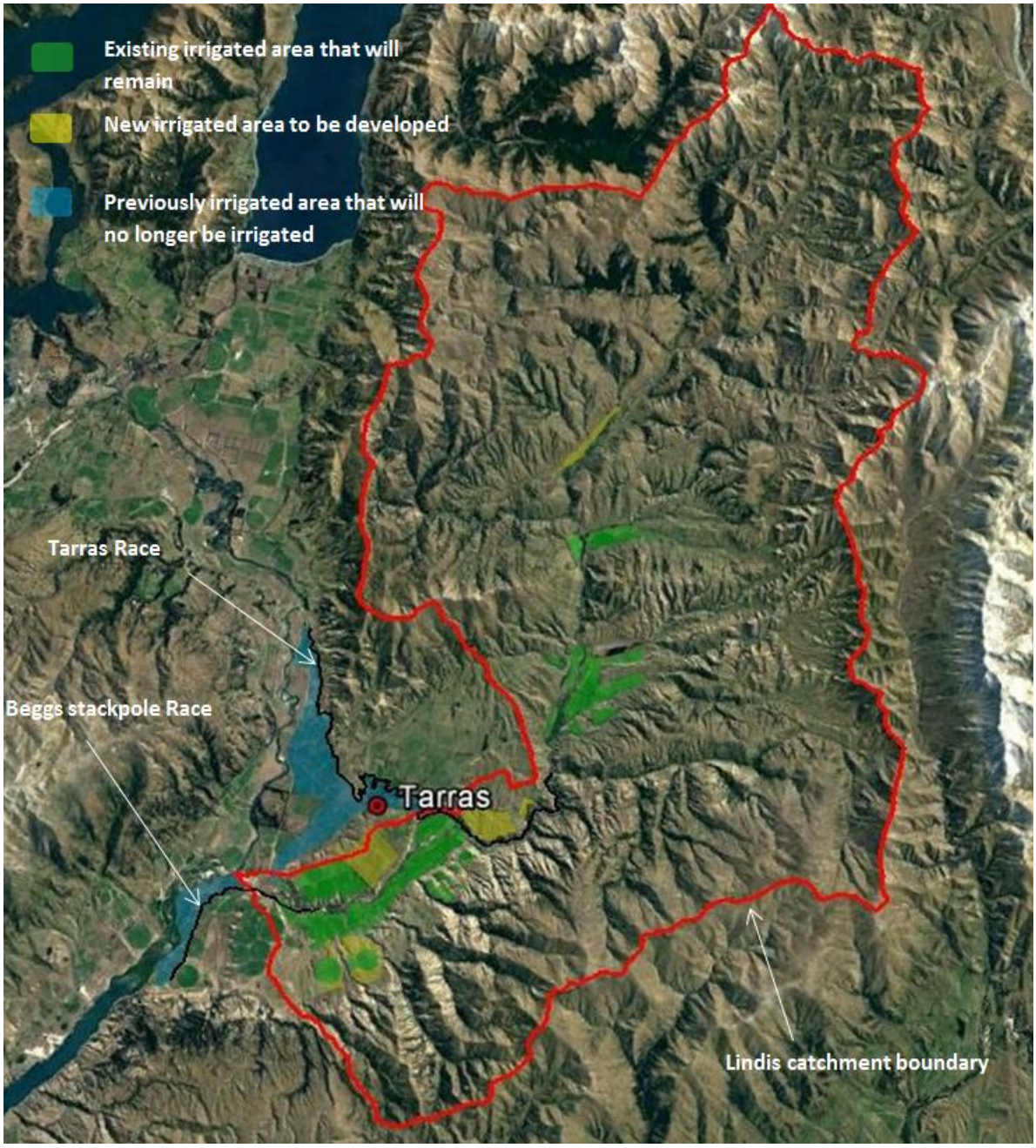

Figure 1: Existing and proposed changes to irrigation command area with water abstracted from the Lindis catchment – Note the proposed area includes area irrigated with supplementary allocation water

The area currently irrigated by water from the Lindis River (including areas now considered 'out of catchment' by Plan Change 5A that are irrigated by the Tarras and Beggs Stacpoole Races) is estimated to be 4,051 hectares.

This will reduce to approximately 2,500 ha within the Lindis catchment (excluding areas irrigated with supplementary allocation water).

Within the Lindis catchment approximately 1,600ha is currently irrigated via spray irrigation, with approximately 1,000ha of this irrigated by pivots. Currently approximately 900 ha are irrigated by border dyke and (a much smaller proportion) by contour flooding. Most of the area under border-dykes and contour flooding will be converted to some form of spray irrigation if a minimum flow of 550 L/sec is implemented, as there will be sufficient reliability of supply to enable this.

Water use in new areas will be made possible by shifting the location of parts of the command area and by continuing to increase the efficiency of irrigation. This requires significant investment in irrigation infrastructure.

The proposal results in contiguous flows throughout the entire Lindis River to the Clutha confluence, with the majority of the Lindis River length carrying flows above 750 L/sec during low flows (Rekker, 2017). The significant improvements to instream flows that would result are shown in Figure 1, with corresponding significant enhancement of in-stream ecological values, cultural values, recreation values, natural character, amenity values, as outlined Section 10.

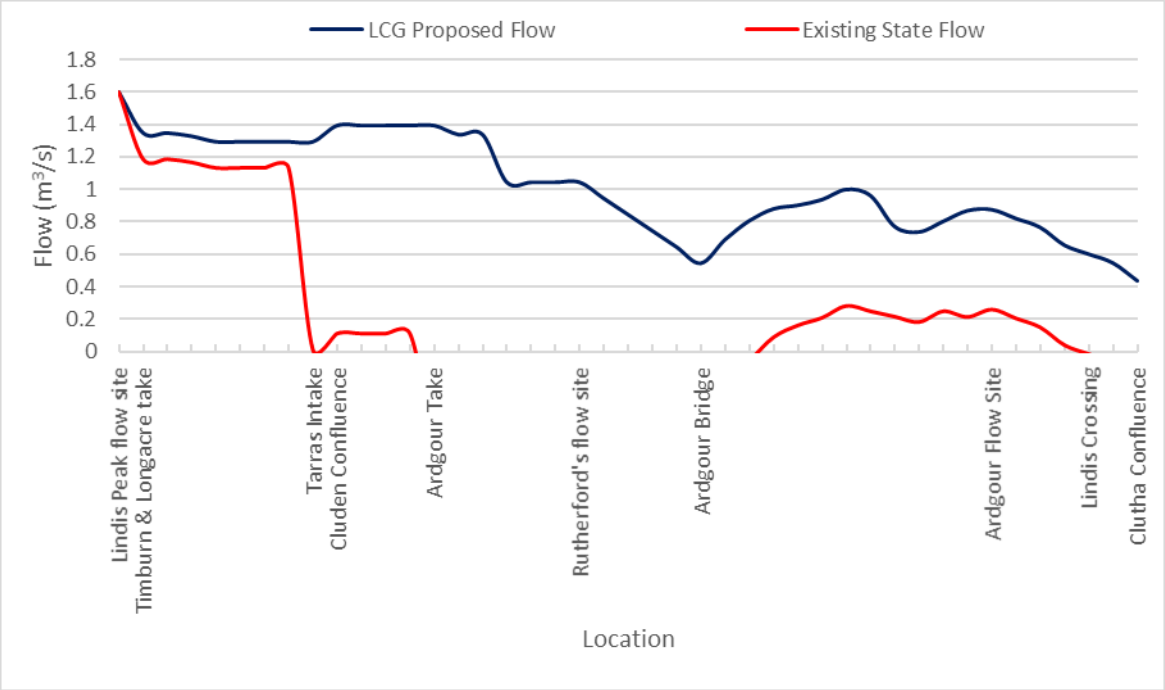

Figure 2: Longitudinal flows for the lower ~25km of the Lindis River comparing the existing state flows to flows expected under the LCG gallery proposal with a 0.550 m3/s minimum flow at Ardgour with an inflow of 1.6 m3/s at Lindis Peak.

Annual volumes proposed by this application are based on the amount of water that has been abstracted annually under the existing consents. This has then been assessed to ensure that it is an efficient use of the water, using a figure of 8,100m^3/ha/year. This figure is based on the Aqualinc (2006) assessment of an efficient volume of water for irrigation for the Manuherikia area, as this area has a comparable climate to the Lindis Catchment.

Part Two: Supporting Information

1. Background context and overview of this application

This suite of resource consent applications is sought in culmination of almost 15 years of community and water user effort to find a workable step change in water resource management and use in the Lindis catchment.

Considerable private and public investment and effort has been given to appraise the existing long serving water management regime and seek improved alternatives. The community and irrigators have sought improvement to the many environmental and human values of the Lindis catchment whilst enabling continued financially viable farm irrigation but with change to modern efficient and less water consumptive infrastructure.

Along this journey a sequence of milestones has been passed with independent professional reports commissioned, considered and actioned to the maximum extent practicable. Key points in this journey are:

1. August 2007: *Tarras Community Plan*. This plan documents history, social, environmental and cultural values of the Tarras community and Lindis catchment and identifies priorities for change/development/protection/improvement.
2. November 2007: *Tarras Irrigation Water Supply Pre-Feasibility Study*. Aqualinc Research Limited. This study assessed future irrigation options for the Lindis catchment and Tarras areas. Many options were considered, including extensive water storage.
3. 2009: Tarras Water Limited (TWL) formed. Proposals developed for an extensive irrigation scheme using Clutha River Mata-Au water in place of Lindis water.
4. January 2010: Otago Regional Council grants TWL consent to take water from the Clutha River Mata-Au for proposed new irrigation scheme.
5. June 2013: TWL proposed scheme is abandoned as it fails to secure sufficient farmer and corporate financing support.
6. 2014: A group of farmers proceed with a private cooperative irrigation scheme covering part of the TWL scheme proposal and using part of the TWL resource consents to take water from the Clutha River Mata-Au. This venture covers much of the Tarras area separated from the Lindis River.
7. May 2015: The Lindis Catchment Group (LCG) was registered as an Incorporated Society. Previously it was an unincorporated interest group.
8. August 2015: Otago Regional Council notifies Plan Change 5A (PC5A) to define the Lindis catchment and set a new minimum flow and primary allocation level.
9. 2016: A second group of farmers proceeds with a private cooperative irrigation scheme covering part of the TWL scheme proposal and using part of the TWL resource consents to

take water from the Clutha River Mata-Au. This venture covers a small portion of the Lower Ardgour area alongside the Lindis River

10. August 2016: Otago Regional Council issues its decision on Plan Change 5A and sets the summer minimum flow at 900 L/sec.
11. September 2016: The Lindis Catchment Group appeals the Otago Regional Council decision on PC5A.
12. December 2016 to April 2017: Environment Court supervised mediation of the appeal on PC5A is conducted. Outcomes include both an agreed memorandum by the experts of parties to the appeal and an agreement between the Lindis Catchment Group and the Otago Regional Council. Both agreements support a revised minimum flow for the Lindis river and a revised primary allocation.
13. May 2017: The parties to the appeal have filed memoranda to the Environment Court seeking or supporting the Court determining the PC5A appeals and this suite of resource consent applications together.
14. June 2017: The Environment Court issued a memorandum granting the request that the PC5A appeals and this suite of resource consents be co-determined by the Court. The Court directed that the suite of applications be lodged by 17 November 2017, or that substantial progress on lodgement have been demonstrated.

Resolution of the appeals on Plan Change 5A does require consideration of how the plan furthers statutory and regulatory objectives and that it be workable and fair to existing users with rights to water.

In seeking to foster a better overall long-term future management regime for the Lindis catchment the Lindis Catchment Group has worked closely with the Lindis Irrigation Company and irrigators, the bulk of whom are served by the irrigation company. This suite of consent applications seeks to fulfil wider community aspirations for the Lindis River in a modern society with modern infrastructure that can be afforded and will serve well for its full investment lifetime.

With all the above factors and associated reports in mind these consent applications are predicated on a set of unique circumstances in which:

A. The existing infrastructure owned by the Lindis Irrigation Company will be decommissioned in favour of creation of a notional scheme with distributed infrastructure and water source points.
B. The two large water intakes known as the Tarras Race and the Ardgour Race and two privately owned historical races will be closed and replaced as irrigation water source points by a sequence of separate pumped bore water takes distributed along the ribbon aquifer in the lower portions of the catchment. This action has two major benefits. Firstly, the river downstream of the two big race intakes, for many kilometres, will become well-watered year-round. Secondly the impact of the replacement takes (the new bores) from the ribbon aquifer will be well buffered with the lower catchment river flows to further limit the impact of irrigation abstraction on lower sections of the river.
C. The fullest conversion of existing irrigation techniques and water conveyance to modern efficient techniques will significantly reduce the total consumption of Lindis water for

irrigation. This arises from efficiency of water take, conveyance, and application as well as the almost completed shift to use of Clutha water where viable.

D. The Lindis River minimum flow and primary allocation are set at levels that will enable the proposed infrastructure changes to be implemented and managed for a sufficiently reliable availability of water.
E. The Lindis River becomes hydraulically connected with surface water year-round with the Clutha River Mata-Au.
F. Adequate time is allowed for (i) the extensive on and off farm infrastructure changes to be designed in detail, costed, financed and completed; (ii) to direct the termination of the two big race intakes without creating excessive hardship; (iii) to ensure the transition never stages through a phase that would provide detriment to the river flow regime

Given these circumstances and propositions it is accepted by the parties to the appeal that effective implementation of a revised PC5A is fundamentally dependant on the existing resource consent structure being changed to give assurance to all parties that the infrastructure changes can and will be made in a safe and coherent manner.

Accordingly, this suite of applications is lodged with a request that the Otago Regional Council refer the applications to the Environment Court for decision making in conjunction with the Court consideration of the PC5A appeals. This course of action will mean that submitters to this suite of resource consent applications will be heard, to the extent they wish, in the Environment Court, not in a Council Commissioners Hearing.

2. Introduction

This is an application:

- To replace various surface deemed permits and water permits within primary allocation limits, including replacement as groundwater connected to surface water
- To replace or apply for new surface water permits within supplementary allocation limits
- To replace groundwater permits as groundwater permits
- To transfer the interest in a number of permits
- To transfer the location of a number of permits
- To construct a number of infiltration galleries (bores)

Table 2: Permits being replaced by this application

Take Point	Consent Number	Name as per consent	Source	Expiration Date
1	96196	R J & S Emmerson and Trust	Station Creek, Lindis River	1 October 2021
2	99298	Russel Stewart Emmerson & Trust	McKenzies Creek	1 October 2021
3	96638.V2	Matthew Robert McCaughan (1/14th share) Geordie Hill Station Limited (13/14th share)	Long Spur Creek	1 October 2021
4	96637.V2	Matthew Robert McCaughan (1/14th share) Geordie Hill Station Limited (13/14th share)	Long Spur Creek	1 October 2021
5a.	99062. V1	John Davis, Lunn Davis	Lindis River	1 October 2021
b.	99328.V1	John Davis, Lunn Davis	Lindis River	1 October 2021
c.	2008.361.V1	John Davis, Lunn Davis	Lindis River	28 August 2028
d.	99022.V1	John Clement Anton Lucas	Lindis River	1 October 2021

e.	99329.V1	John Clement Anton Lucas, Elizabeth Ann Lucas	Lindis River	1 October 2021
6.	97059.V2	John Davis, Lunn Davis	Tim Burn	1 October 2021
7	96077.V1	John Davis, Lunn Davis	Cluden Creek	1 October 2021
7	99021.V1	John Clement Anton Lucas	Cluden Creek and Coal Creek	1 October 2021
11	2001.807.V2	Lindis Irrigation Limited	Lindis River	1 October 2021
12	2001.809	Lindis Irrigation Limited	Lindis River	1 October 2021
31a	2003. 110	Lindis Irrigation Limited	Cluden Swamp	1 October 2021
31b	2006.254.v1	Lindis Irrigation Limited	Cluden Swamp	1 October 2021
31c	2003.251.V1	Cluden Station Limited	Unnamed tributary (Cluden Swamp), Clutha River	1 October 2024
13	96066	Alastair Askin Rutherford, Suzanne Elizabeth Rutherford	Lindis River	1 October 2021
14	96067.V2	Alastair Askin Rutherford, Suzanne Elizabeth Rutherford	Waiwera Creek	1 October 2021
30	2003.186.V1	Lindis Irrigation Limited	Bore from Road Reserve, across from Lindis River	8 September 2028
15	2001.544.V1	Peter William Jolly	Lindis River	12 March 2019
32	2001.546	Peter William Jolly	Spring	21 October 2021
16	WR1753CR	John Charles Perriam, Bendigo Terrace Farming Ltd Partnership.	Lindis River	21 October 2021

		(known as Beggs Stacpoole)		
16	WR778796CR	John Charles Perriam, Bendigo Terrace Farming Ltd Partnership. (known as Beggs Stacpoole)	Lindis River	21 October 2021
17	2000.690	John Charles Perriam (3/100th Share). Shepherds Creek Limited (97/100th share). Tarras Farm Limited Partnership (194/300th share).	Shepherds Creek	1 October 2021
18	2001.995	Terence John Cooke, Josephine Cooke	Tarras	4 December 2021

Table 3: Permits not being replaced by this application but still within the Lindis Catchment Group Managed Water.

Consent Number	Name as per consent	Source	Expiration Date
3916	Miles Cameron White and Mark James Cunningham Faulks being trustees of the J G Lucas Family Trust, and James Gordon Luas and Marion Lesley Lucas	Eight Mile Creek	1 October 2021
95928	James Gordon Lucas (2/5th share). Marion Lesley Lucas (1/5th share). Myles Cameron White and Mark James Cunningham Faulks being trustees of the JG Lucas Family Trust (2/5).	Nine Mile Creek	1 October 2021
2008.364.v1	Lindis Downs	Lindis River (Mid)	9 April 2030
2007.497.v1	Cloudy Peak	Lindis River	1 October 2032
2004.230	Wainui Pastoral Ltd	Wainui Creek	1 October 2032
2007.496	Wainui Pastoral Ltd	Dry Creek	1 October 2032

3. Location of Activity

All of the permits being replaced by this application are located within the Lindis catchment, as shown on operative Maps B4 and B7 of Plan Change 5A, except for Take Points 31 and 32, which are in the broader Clutha River catchment.

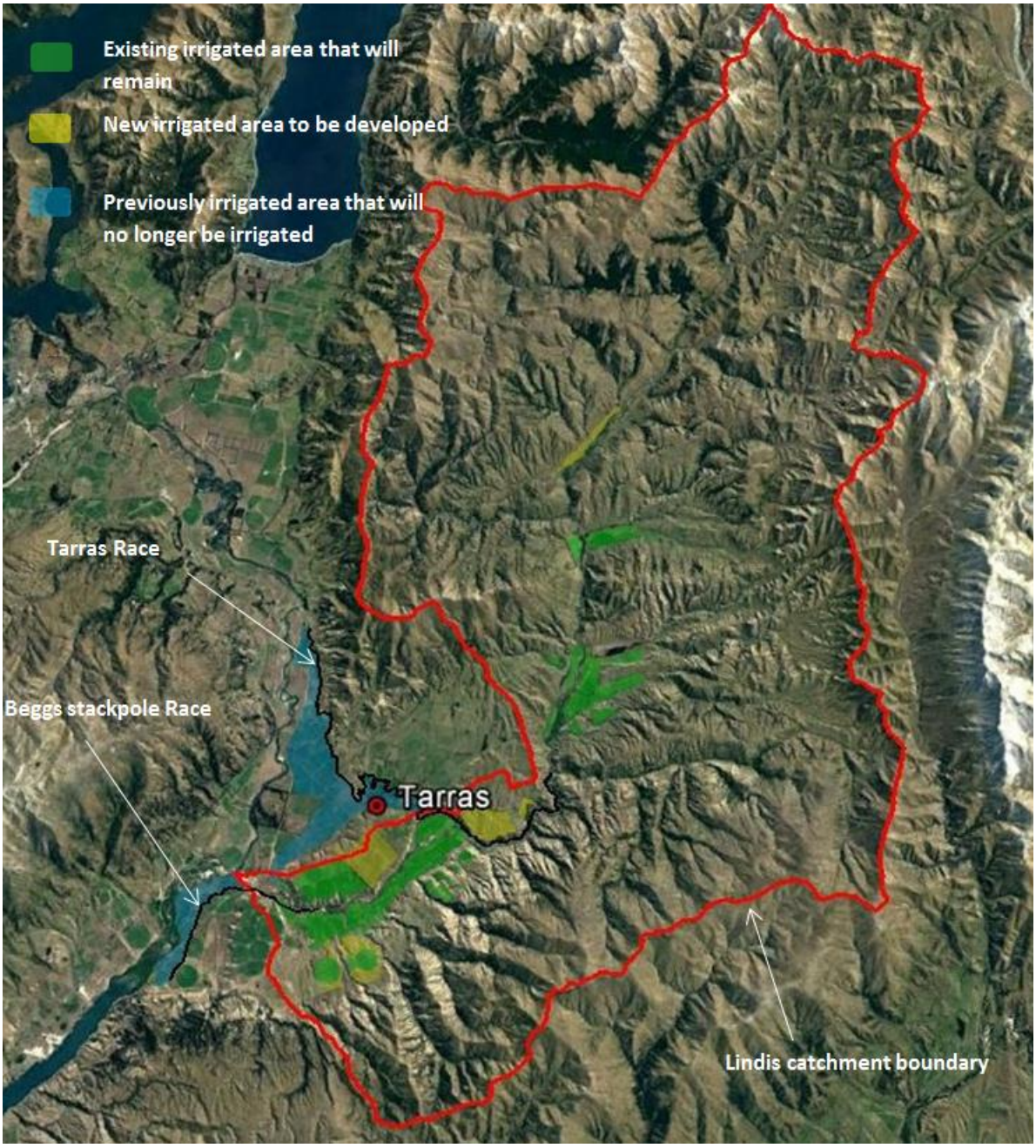

Figure 3: Lindis catchment map

Table 4 lists the locations of the take points and Figure 4 and Figure 5 illustrates the location of these.

Table 4: Take Point locations of permits being replaced

Take Point	Consent number	Location of Point of Take	Map Reference	Legal Description of consent Location	Location of use
1.	96196	Forest Range Station, Station Creek.	NZMS 260 G40: 326 - 127	Part Run 236B, Block IX, Lindis Survey district.	Run 236B
2.	99298	Forest Range Station, McKenzies Creek.	NZMS 260 G40: 311 - 105	Part Run 236B, Block V Lindis Survey District.	Run 236B
3.	96638.v2	An unnamed tributary of Long Spur Creek, known locally as Rocky Creek, approximately 2.5 kilometres northeast of the intersection of Lindis Pass-Tarras Road and Goodger Road, Lindis Valley.	NZMS 260 G40: 347 – 075	Run 680	Secs 2,3,4, Pt Secs 4,6, SO 354548, Sec 1-2 SO 374088
4.	96637.v2	Long Spur Creek, approximately 3.3. kilometres northeast of the intersection of Lindis Pass – Tarras Road and Goodger Road, Lindis Valley.	NZMS 260 G40: 357 – 075	Run 680	Secs 2,3,5, Pt Secs 4,6 SO 354548, Secs 1-2 SO 374088
5a.	99062.V1	Lindis River, adjacent to State highway 8. approximately 700 metres upstream of Elliots Bridge	NZMS 260 G40: 335 – 011	Reserve adjacent to Run 676 Block II Cluden SD.	Sec 15-22 SO 354550
b.	99328.V1				
c.	2008.361.V1				
d.	99022.V1				Sec 3,4,5 SO 354550
e.	99329.V1				
6.	97059.v2	True Right bank of Tim Burn, approximately 2	NZMS 260 G40:	Sec 18 SO 354550	Sec 15-22

Take Point	Consent number	Location of Point of Take	Map Reference	Legal Description of consent Location	Location of use
		kilometres upstream of the confluence with the Lindis River.	359 - 006		SO 354550
7a.b.	99021.v1	Cluden Creek, approximately 15 kilometres upstream of the confluence with the Lindis River.	Cluden: NZMS 260 G40: 469-994. Discharge from Coal Creek: NZMS 260 G40: 458 – 001. Re-taking from Coal Creek: NZMS 260 G40: 375 – 999	Part Run 237G Block IV Cluden Survey District.	Sec 3,4,5 SO 354550
7a.b	96007.v1	Cluden Creek and Coal Creek, approximately 15 kilometres upstream of the confluence with the Lindis River.		Run 237F, Sec 2 SO 354550, Sec 16 SO 354550	Sec 15-22 SO 354550
11.	2001.807v2	From the true right bank of the Lindis at a point approximately 150 metres upstream of the confluence of Cluden stream and the Lindis River. Tarras main race	NZMS 260 G40: 341 – 944	Run 237F	As per map
12	2001.809v1	At the Ardgour main race intake which is on the true left bank of the Lindis River at the upstream end of Archies Flat.	NZMS 260 G40: 339 – 926	Run 237F SO1192	As per map

Take Point	Consent number	Location of Point of Take	Map Reference	Legal Description of consent Location	Location of use
13.	96066	Lindis River, approximately 3.8 kilometres northeast of the intersection of Ardgour road and Lethbridge Road, at the north end of Ardgour Valley, Lindis.	NZMS 260 G40: 327 – 904	Reserve adjacent to Run 236U, Block IX, Cluden SD.	PT SEC 3 BLK XV TARRAS SD SEC 2 BLK IX CLUDEN SD, RUN 236U
14.	96067.V2	From Waiwera creek at two points: one at 1.5 kilometres upstream, and the other at 3.5 kilometres upstream of the Confluence of Waiwera Creek, and the Lindis River.	NZMS 260 G41: 291 – 879, and G41: 326 – 867	Part Section 3, Block VX, Tarras Survey District; and run 236U Block XIII Cluden Survey District.	
30.	2003.186.v1	From a bore situated on Road reserve, 50 metres west of the Ardgour Road bridge across the Lindis River.	NZMS 260 G41: 288 – 894	Road Reserve adjacent to the Ardgour Road Bridge across the Lindis River, Sec 15, Blk XV, Tarras SD.	domestic
15.	2001.544.v1	True right bank of the Lindis River, approximately 3 kilometres west of Tarras township, Central Otago.	NZMS 260 G40: 303 – 908	Adjacent to Sec 15 Blk XV Tarras SD.	LOT 3 DP 483646
16.	WR1753CR + WR778796CR	Beggs stacpoole race (also referred to as Beggs Stacpoole)			
17.	2000.690	An open race from Shepherds creek approximately 4	NZMS 260 G41: 256 – 809	Unformed legal road, Sec 17 SO 24641 and Lot 4	LOT 2 DP 509332,

Take Point	Consent number	Location of Point of Take	Map Reference	Legal Description of consent Location	Location of use
		kilometres south east of the Lindis River, at the point where Shepherds Creek flows out from the foothills onto the terrace. A second point of take is a 40mm pipeline intake approximately 120metres upstream of the open race.	(Water race). NZMS 260 G41: 257 – 808 (Pipeline intake).	DP 300805	Lot 1 DP 505064
18.	2001.995	Tarras, approximately 250 metres Northwest of the intersection of Thomson Gorge Road and Ardgour Road. Cooke	NZMS 260 G41: 240 – 848	Lot 2 DP 300395	LOT 2 DP 455645, LOT 2 DP 300395
31a	2003.110	Cluden swamp on the east side of Munro Lane, Tarras. retake	NZMS 260 G40: 265 – 914	Pt Lot 5 DP3510 Blk I Tarras SD	
31b	2006.254.v1	Cluden swamp on the east side of Munro Lane, Tarras.		Pt Lot 5 DP 3510 Blk I Tarras SD	
31c	2003.251.v1			Lot 1 DP425892	
32.	2001.546	Springs east of Jolly Rd Tarras	NZMS 260: G40:259 915	Pt Lot 6 DP 3510	PT LOT 6 DP 3510

Table 5 provides an overview of the takes proposed to replace the large race intakes at Take 11, 12, 13 and 16, if a minimum flow of 550 L/sec is implemented for the catchment. Locations of these takes are shown in Figure 24 and Figure 25.

Table 5: Location of new gallery intakes

Take point	Shareholder	Located at or within Location Range (NZTM2000)	Location Range from NZTM2000 point	Legal description of location of water use
As replacements to Take 11 (Tarras Race)				
T1	Cluden Station-Purvis	1323597 5031025	Within 400m upstream or downstream within Cluden Station land on the Lindis River.	SEC 3 SO 463650 Plus Crown Land*
T3	Kotiti-P.Jolly (becomes Smiths)	1320578 5029181	At Take 15 current point of take or within 200m downstream	LOT 3 DP 483646, LOT 4 DP 483646, LOT 1 DP 483646, Plus Crown land*
T2	Pukemara - Hayman	1317900 5025815	Along the Lindis River boundary of Pukemara property within 400m either side of location point	SEC 6 BLK XV TARRAS SD
T4	Lindis Crossing Station	1312808 5024716	100 metres to the south east of SH8, to a point located 360m north of the intersection of SH8 and Maori Point Road	LOT 1 DP 426163
T5	Cookes	Between 1314186 5026239 and 1313605 5025668	Between the NZTM2000 points 50 metres back from the property boundary adjacent to SH8	N/A only applying for consent to construct a bore
R13	Rutherford	1320958 5028548	Within a 300m radius of this point	PT SEC 3 BLK XV TARRAS SD SEC 2 BLK IX CLUDEN SD, RUN 236U
As replacements to Take 12 (Ardgour Race)				
A1	Williams	1318512 5025586	Within a 300m radius of this point	LOT 4 DP 392523

Take point	Shareholder	Located at or within Location Range (NZTM2000)	Location Range from NZTM2000 point	Legal description of location of water use
A2 (same site at B2)	Cloudy Peak-Rive	1317752 5024986	At this existing take point for 2007.497 or away from the river further. Within a 400m radius of this existing point	LOT 1 DP 450337, LOT 4 DP 450337
A3	McElrae	131235 5025414	400m radius on McElrae land	Lot 1 DP375322
A4	Small block owners	1316889 5024395	500 m radius	LOT 2 DP 392523, LOT 1 DP 375322, LOT 3 DP 392523, Lot 1, Lot 2, Lot 4 DP 342832, Lot 2 DP 432876, Lot 2 DP 410980 and Lot 1, 5 DP 432876, Lot 1 DP 300185, Lot 2 DP 432876, Sec 34 Block XVI Tarras SD, Sec 35 Block XVI Tarras SD
A5	Madill	1316610 5023990	Within 300m radius of this point	SEC 51 BLK XVI TARRAS SD
A6	Trevathan, B Jolly	1316457 5023599	Within the Dry Creek area 400m from point listed (or multiple points)	Lindisvale Trevathan: LOT 1 DP 25202, PT SEC 25 BLK XVI TARRAS SD, SEC 24 BLK XVI TARRAS SD, SEC 50 BLK XVI TARRAS SD Ardgour Station: LOT 2 DP 509332
A7	Cooke	Between 1314453 5022881 and 1314921 5023127	Within a stretch between the NZTM200 points	Lot 2 DP 300805, Lot 4 DP 300395

Take point	Shareholder	Located at or within Location Range (NZTM2000)	Location Range from NZTM2000 point	Legal description of location of water use
A8	Dry Creek Enterprises	1316094 5023608	Within 300m radius	SEC 49 BLK XVI TARRAS SD
A9	Wainui Station-Rive	1323597 5031025	Within a 400 m radius of the MRAPA	Lot 2, 5 DP 450337
Replacement of Rutherford, The Point, Race Intake (Take 13)				
R13	Rutherford	1320958 5028548	Within a 300m radius of this point	PT SEC 3 BLK XV TARRAS SD SEC 2 BLK IX CLUDEN SD, RUN 236U
Replacement of Beggs Stacpoole Race Intake (Take 16)				
B1	Lindis Crossing Vineyard	1312671 5023499	Within a 400 m radius from this point	LOT 1 DP 311352 Blk XIV SO 24642
B2 (same site as A2)	Cloudy Peak-Rive	1317752 5024986	At this existing take point for 2007.497 or away from the river further. Within a 400m radius of the existing point	LOT 1 DP 450337, LOT 4 DP 450337

**No legal description available via Land Information NZ, will be requested from DOC and supplied to ORC*

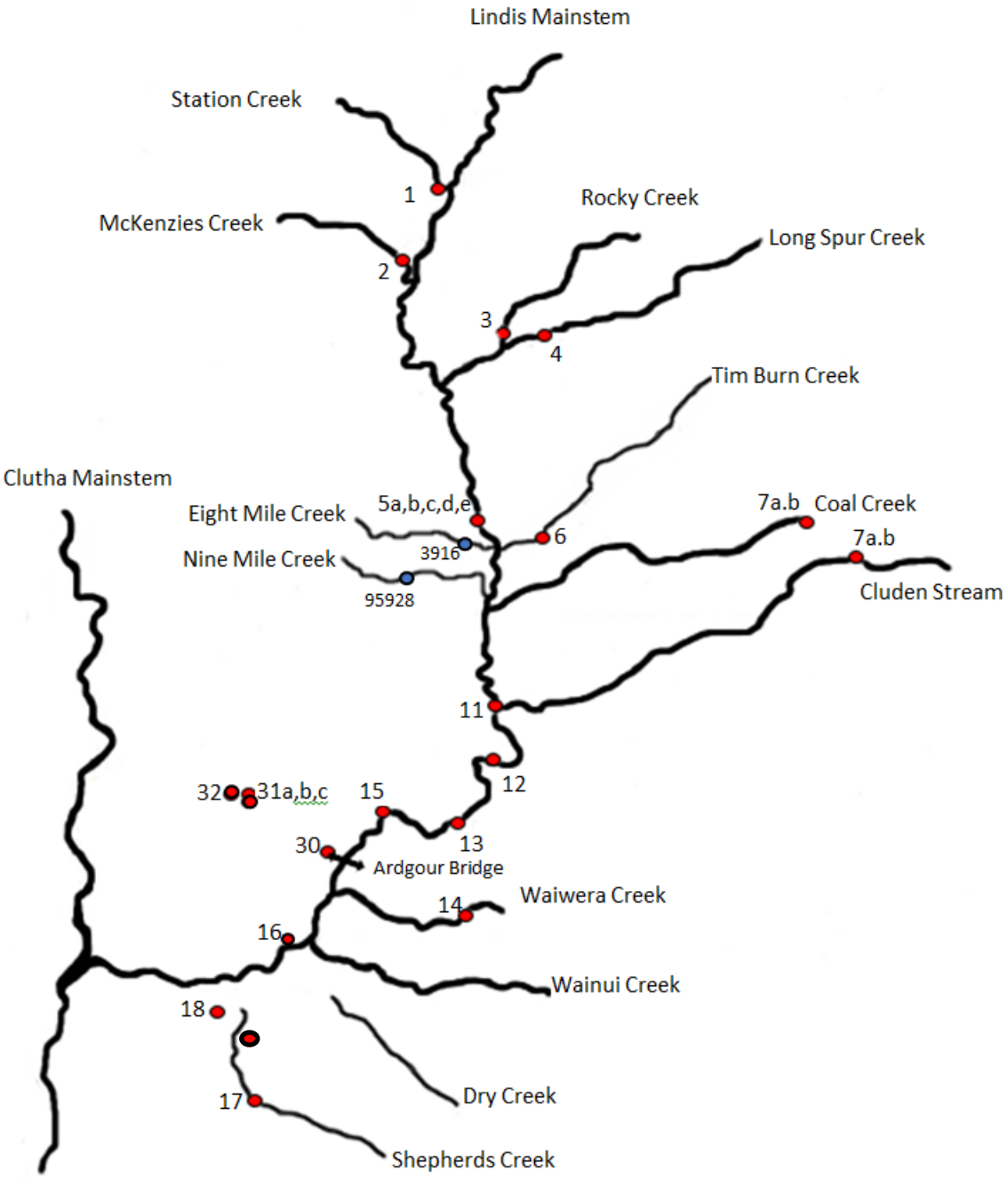

Figure 4: Locations of existing permits (indicated by take numbers used in this application). Takes in blue (Permits 95928 and 3916) are not being replaced via this application.

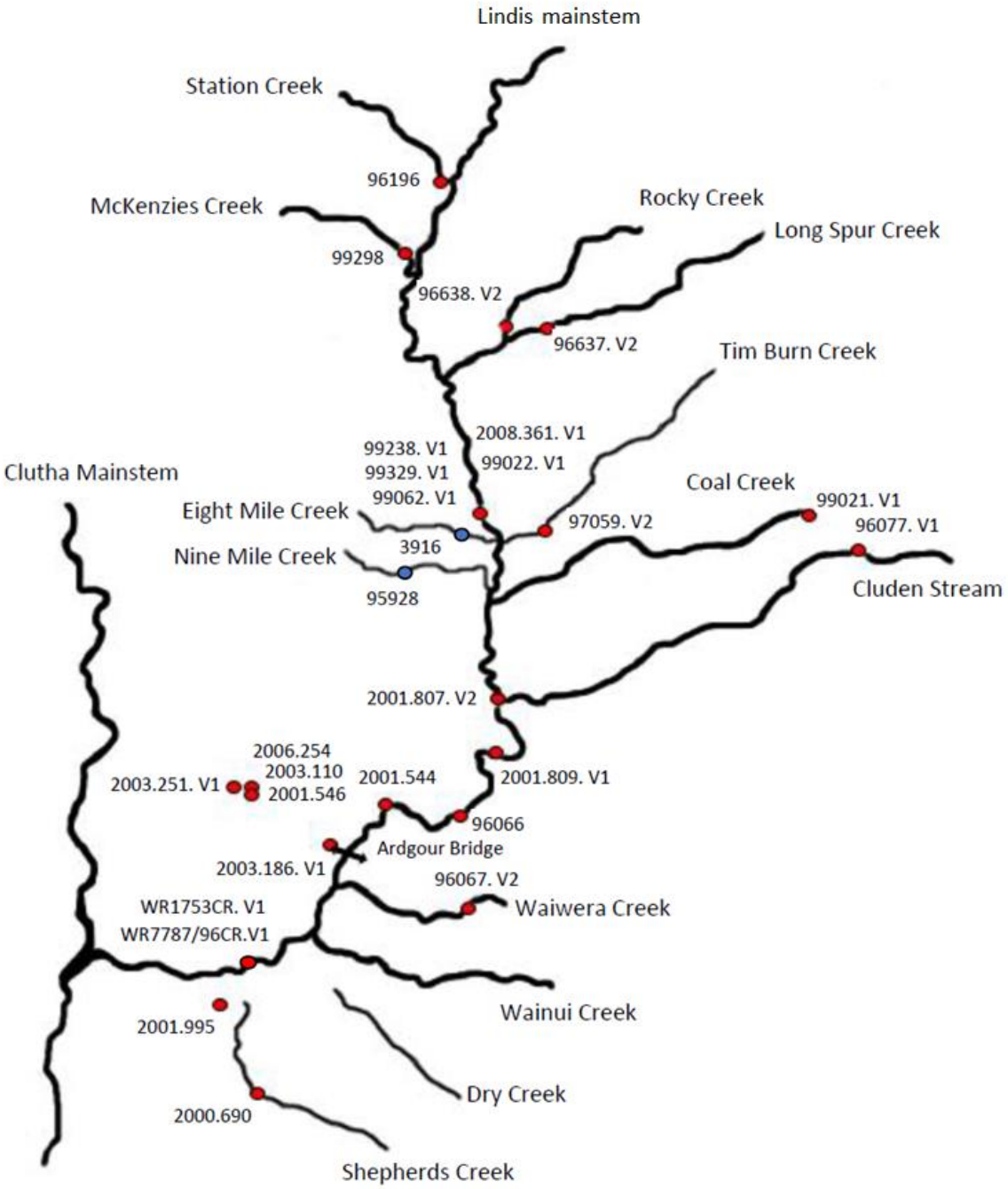

Figure 5: Locations of existing permits (shown with permit numbers). Takes in blue (Permits 95928 and 3916) are not being replaced via this application.

4. Physical Setting of Activity

4.1 Lindis River

The Lindis catchment covers an area of 984km^2 and includes the areas of Ardgour, Lindis Valley and the Lindis Pass. The catchment consists of a steep river valley, ranging in elevation from 1925m to 220 m above sea level. The topography of the catchment varies from river flats and more open valleys in the lower catchment to gently undulating land and then steeper mountainous topography in the headwaters of the catchment.

Hydrology of the Main-stem

The Lindis River has two permanent continuous flow sites, one at Lindis Peak above all main-stem abstractions and the other at Ardgour below all main-stem abstractions, and a third temporary flow site (Rutherford's) approximately halfway between the two (Figure 6).

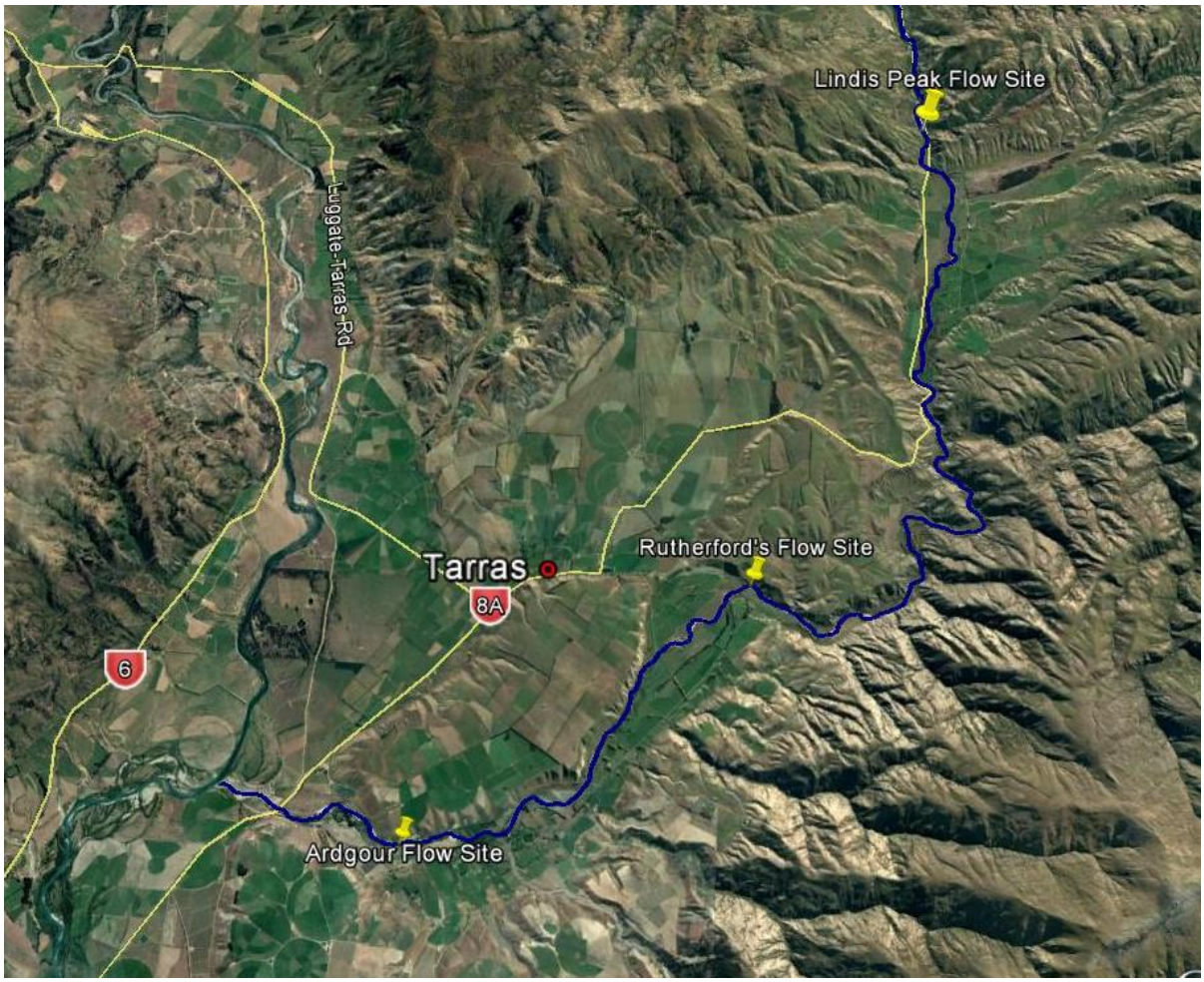

Figure 6. Map showing the Lindis Peak and Ardgour flow sites (proposed minimum flow site) on the Lindis River.

The following flow statistics for the Lindis River at the Lindis Peak and Ardgour flow recorders give context to the flows currently experienced compared to those that would occur naturally.

Table 6. Observed flow statistics for Lindis Peak and Ardgour flow sites as well as naturalised flows for Ardgour.

Site	$Q_7$10 (m^3/s)	$Q_7$5 (m^3/s)	7-Day MALF (m^3/s)	Median Flow (m^3/s)	Mean Flow (m^3/s)
Lindis Peak observed	0.956	1.053	1.462	4.349	6.237
Ardgour observed	0.150	0.169	0.252	3.836	5.428
Ardgour naturalised	0.980	1.160	1.750	4.776	7.076

Significant hydrological investigations have shown that the Lindis River downstream of the Rutherford's flow site has significant interaction with groundwater, with both losing and gaining reaches (Figure 7) (Rekker, 2017; Dale and Olsen, 2015; ORC, 2008). During times of low flow (< 1000 L/sec) losses to groundwater in the lower losing reach (near Lindis Crossing Bridge) have been identified as 450 L/sec (Appendix A: Joint Witness Statement A). Losses to groundwater from the upper losing reach (above the Ardgour Rd Bridge) have been estimated at ~400 L/sec by Rekker (2017) and this estimate has been endorsed by experts (Appendices A and B: Joint Witness Statements A & B).

Figure 7.Known losing (shown in red) and gaining (shown in green) reaches in the lower Lindis River

These losses to groundwater mean that flows in the Lindis River immediately above its confluence with the Clutha River will be 450 l/s less than recorded at the Ardgour flow site as the losses do not return back to the Lindis River. Losses to groundwater in the upper losing reach above the Ardgour Bridge return to the Lindis River between the Ardgour Bridge and the Ardgour flow site (Figure 7).

Hydrology of tributaries of the Lindis River

Water is also abstracted from 14 tributaries to the Lindis River, as shown on Figure 4 and Figure 5 above. These streams are characterised by very low natural flows in the streams, with many of the streams assessed having natural low flows of 10 L/sec or less.

Nine of the 14 streams assessed dry naturally in their lower reaches due to a combination of groundwater losses and low flows. Often these streams exit confined gorge sections and flow across alluvial gravel reaches before they reach the Lindis River.

4.2 Climate

The Lindis catchment is made up of 2 distinct climates- the lower and the upper. The lower catchment is one of the driest in New Zealand, with a very limited rainfall in the summer months. Median annual rainfall is in the range of 400 to 450 mm in the lower part of the catchment, and between 501 and 550mm in irrigated valleys further up the catchment. During a dry summer, rainfall (January to March) irrigated areas in the lower part of the catchment can receive less than 80mm while in the mid-catchment they can receive less than 100mm.[1]

The upper catchment is wetter primarily due to its high altitude, and receives large amounts of rainfall and snow during winter and spring. There is no irrigation in the upper catchment.

The area is also known for extreme temperature fluctuations and has a short growing season.

4.3 Soil types and Profile Available Water

Limited information is available on soils within the command area to the north of (but not including) the Lindis Valley) however at the soil order scale the soils here are classified as pallic soils (typically argillic or immature pallic soils in this area). Pallic soils have weak structure and high density in subsurface horizons, are dry in summer and wet in winter. Parent materials are commonly loess derived from schist or greywacke. These soils have slow permeability with limited rooting depth, and medium to high bulk density. They are susceptible to erosion because of high potential for slaking and dispersion.[2]

[1] http://growotago.orc.govt.nz/
[2] https://soils.landcareresearch.co.nz/describing-soils/nzsc/soil-order/

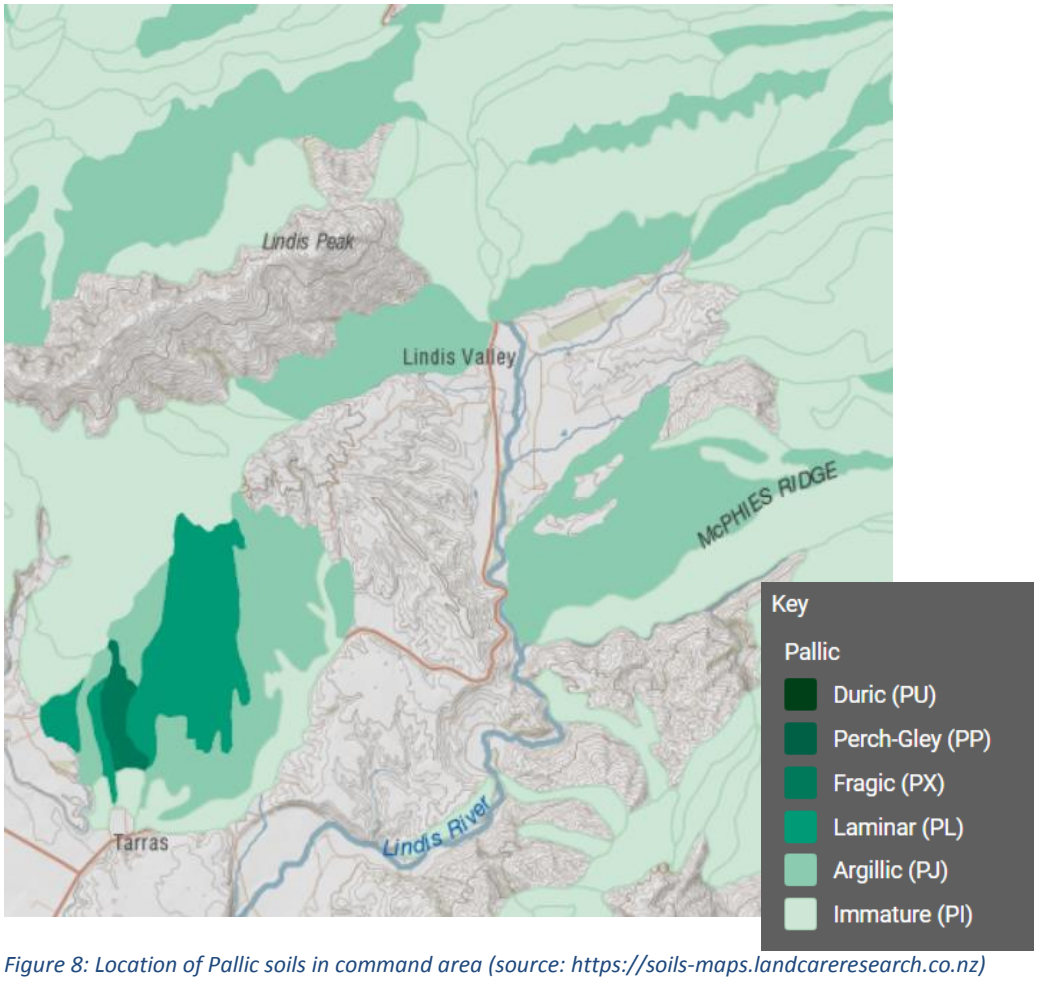

Figure 8: Location of Pallic soils in command area (source: https://soils-maps.landcareresearch.co.nz)

The bulk of the soils in the lower half of the catchment (from the Lindis Valley to the south), primarily through the Ardgour Valley) are semi-arid soils. Semiarid soils are dry for most of the growing season. Rain is not sufficient to leach through the soil, so lime and salts accumulate in the lower subsoil. Nutrient levels are relatively high, but the soils must be irrigated to produce a crop. These soils cover 1% of New Zealand, and occur where annual precipitation is less than 500mm. This occurrence highlights the unique challenges of farming in this area. These soils have high slaking and dispersion potential, and moderate to high bulk densities. Soil structure is usually weakly developed and the soils are erodible.

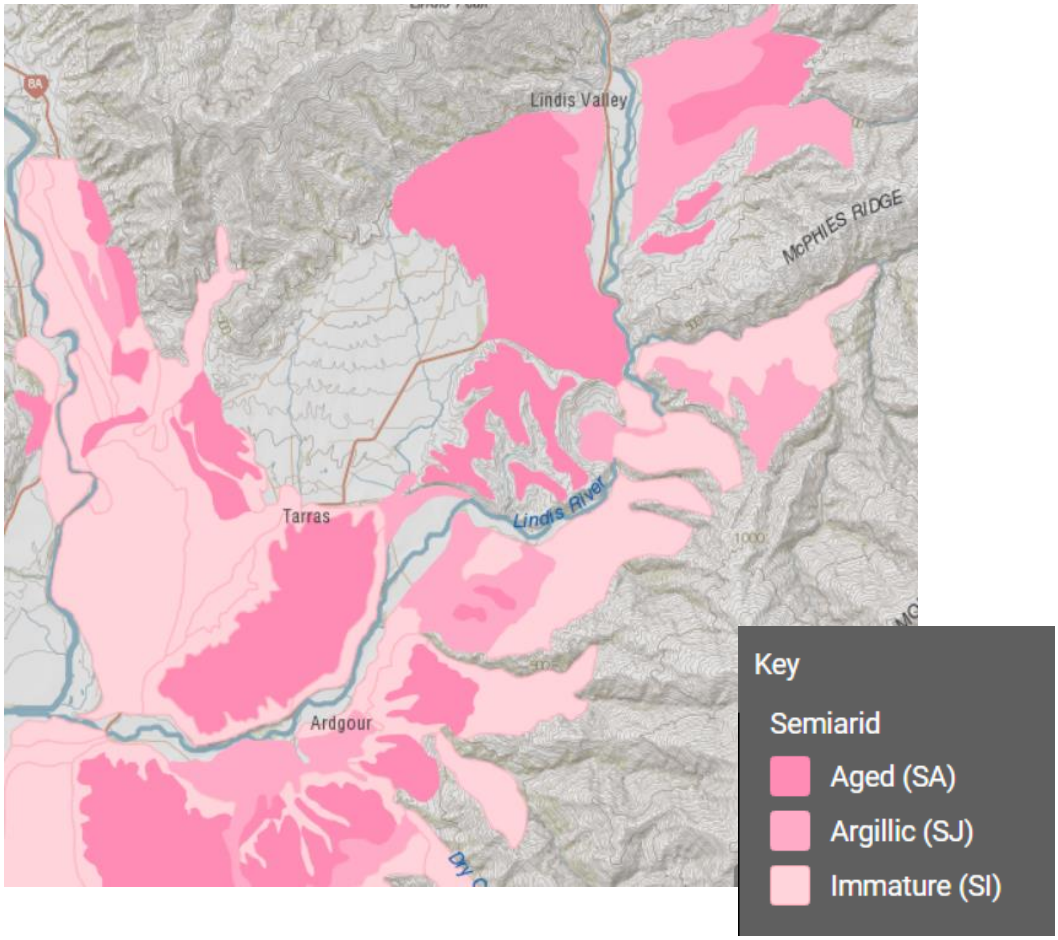

Figure 9: Location of Semiarid soils in Command Area (source: https://soils-maps.landcareresearch.co.nz)

The remaining ribbon of soil along the Lindis River as it passes through the Lindis and Ardour Valleys are classified as Fluvial Recent soils, which contain sediments deposited by water. These soils have variable soil texture, with common stratification of contrasting materials. They are generally deep rooting and have high plant-available water capacity.

This part of the command area is dominated by very shallow to shallow (often sandy) loams.

Profile available water (PAW) is one of the indicators commonly used by the ORC to identify the volume of water needed to efficiently irrigate an area. In general terms PAW is the amount of water held in a soil that can be easily extracted by plant roots, within the potential rooting depth. Profile available water has only been mapped for the lower half of the command area. Within this area profile available water primarily ranges from low to moderate.

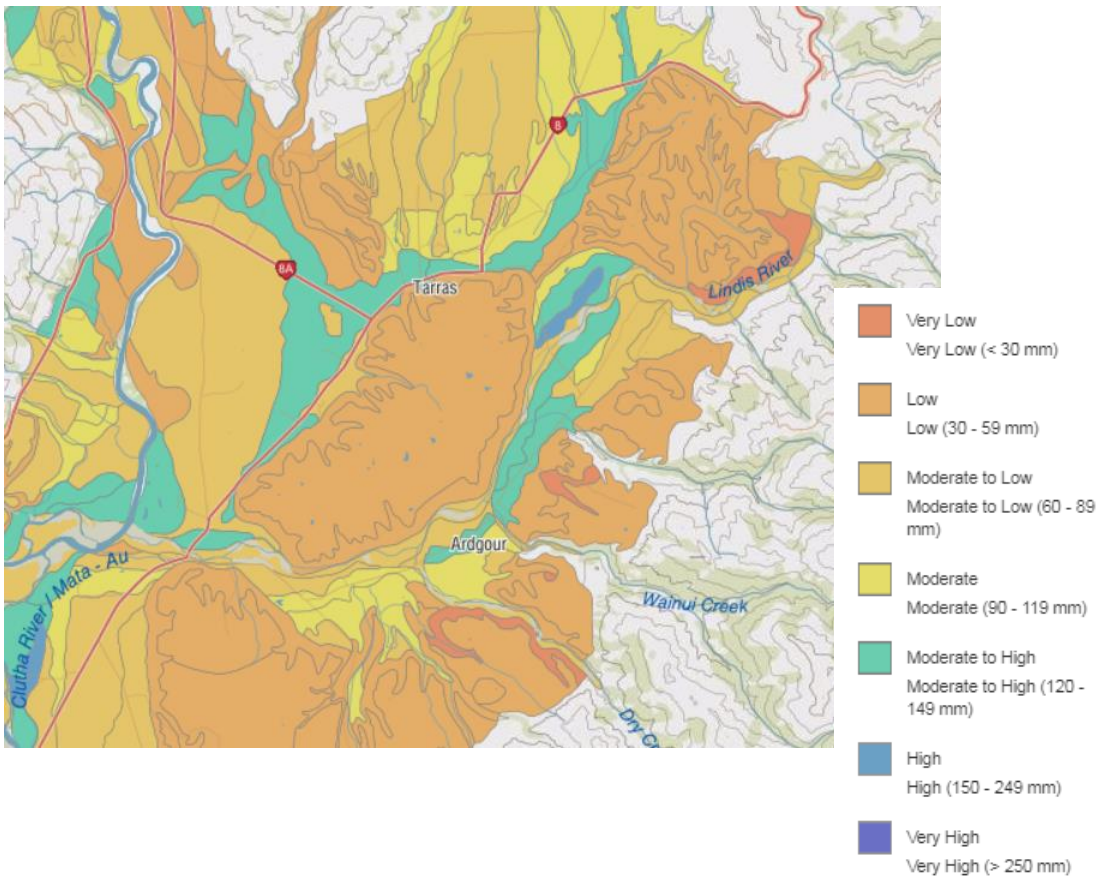

Figure 10: Profile Available Water in the Lower Lindis Catchment (source: https://smap.landcareresearch.co.nz)

4.4 Efficient Allocation Based on Physical Setting and Crop Type

As a starting point, reasonable irrigation water requirements are assessed in Otago using a desk top exercise based on a report prepared by Aqualinc for the Otago Regional Council - referred to as the "Aqualinc report" (Aqualinc, 2006). Aqualinc developed a water-balance model that was used to estimate soil moisture levels over a 25-year period. This model takes into account the local climate, the types of soils, crop types and the irrigation system. The Aqualinc report is premised on 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 Aqualinc report includes the Lindis catchment in the Upper Clutha area, which includes Wanaka and its surrounds. The Lindis catchment does not receive the westerly rain pattern that fall on the Southern Alps to the west of Wanaka.

The amount of water required to efficiently irrigate pasture in the Lindis catchment is significantly affected by the extremely dry and hot climatic conditions and short growing season that characterise conditions in this area. These conditions mean that applying a generalised approach to the Lindis

Valley that is influenced by climate and soil data from the Upper Clutha area including Wanaka (which the Lindis catchment has previously been grouped), or other dissimilar parts of New Zealand is not appropriate.

Accordingly, a figure of 8,100m^3/ha/season is considered more appropriate for the climate conditions experienced in the Lindis catchment – this is based on the Aqualinc report's seasonal limit for the Manuherikia Valley which sets between 8,850 to 8,050m^3/ha/year for the growth of pasture in areas with a low to moderate PAW. This is used because the Manuherikia area experiences climatic conditions much more akin to the Lindis catchment (Aqualinc, 2006). The Manuherikia catchment is just to the east over the Chain Hills and Dunstan Mountains.

5. Overview of water management and use

5.1 Lindis Catchment Group

The Lindis Catchment Group (LCG) was incorporated on the 21st May in 2015. The members are primarily farming families and water users in the catchment. However membership is open and there are a couple of community members in the group who are not water right holders. All irrigators (except Oak Tree Ltd) using water from the Lindis River or its tributaries are members of the LCG. The LCG is an incorporated society and has an independent chairperson. The largest water rights in the catchment are owned by the Lindis Irrigation Company (LIC). Although they abstract the highest rates, the water is shared by many as they have 37 shareholders.

The LCG was initially formed to begin the process of replacing all the water permits under a Group Managed Water regime. However the Lindis minimum flow plan change process stalled the permit replacement and development of group managed water. This was because without knowledge of what the minimum flow would be, the irrigators did not know how reliable their supply of water would be and were therefore unable to plan for or consider their irrigation set-up or even understand whether their farm would still be viable.

The LCG includes nearly all the water users and, as many own deemed permits which expire in 2021, the bulk of the water permits in the catchment are being replaced with this application. The LCG have developed a Flow Sharing Regime that encompasses all water users except one (Oak Tree Ltd) that is located on a tributary. This Regime will be implemented to enable water users to share the limited water resource as the flow drops towards the minimum flow. LCG will be motivated to keep the flow above the minimum flow in order to maintain at least a small amount of water abstraction.

The LCG members are lodging these permits as a group package and will manage them together to achieve the minimum flow but seek to have their permits reissued under their individual names (except initially for the LIC consents) with a linking consent condition regarding sharing water under the Council approved Rationing regime.

5.1.1 Water Use and Surety of Supply

The area currently irrigated by water from the Lindis River (including areas now considered 'out of catchment' by Plan Change 5A that are irrigated by the Tarras and Beggs Stacpoole Races) is estimated to be 4,051 hectares.

This will reduce to approximately 2,500 ha within the Lindis catchment (excluding areas irrigated with supplementary allocation water). This application seeks water to irrigate approximately 200ha out of the Lindis catchment (from takes located outside of the catchment), as a replacement for the water that would have been delivered by the Tarras Race.

Within the Lindis catchment approximately 1,600ha is currently irrigated via spray irrigation, with approximately 1,000ha of this irrigated by pivots. Currently approximately 900 ha are irrigated by border dyke and (a much smaller proportion) by contour flooding. Most of the area under border-dykes and contour flooding will be converted to some form of spray irrigation if a minimum flow of 550 L/sec is implemented, as there will be sufficient reliability of supply to enable this.

The applicants propose a reconfiguration of takes and reduction in total allocation, as set out in the following sections. This results in a reduced take from the Lindis River main-stem from 2893 L/sec to 1326 L/sec. The aim of this is to use less water very efficiently via spray irrigation. Security of supply is vital to be able to utilise spray irrigation systems. Put simply, they operate by applying small amounts of water often. The imposition of a minimum flow at Ardgour essentially reduces existing security of supply as the water relinquished to deliver these environmental flows is the most reliable, often most of the 100% reliable water. Where existing infrastructure is in place such as a pivot, reducing supply security by a few percentage points can have significant effects.

Aqualinc (2016) provide advice that most new irrigation schemes in New Zealand are designed to deliver 95 – 98% supply reliability and that a reliability of below 95% can restrict land use options which in turn restricts investment in new irrigation infrastructure. This is interpreted to mean that for infrastructure such as pivots, reducing security below 95% is a significant risk.

Based on recorded flows at Lindis Peak during the irrigation season and accounting for an additional 0.2 m^3/s input downstream of the recorder the applicant's proposal to take 1109 L/sec from the main-stem above the Ardgour flow site with a minimum flow of 550 L/sec provides a surety of supply of ~89%.

The LCG proposal provide security of supply levels less than recommended by industry sources which would target 95% for spray irrigation systems (Aqualinc 2016). To obtain a surety of supply of ~95% during the irrigation season with total take of 1109 L/sec a minimum flow of ~265L/sec would be desirable.

However, the applicant recognises that a minimum flow of 265 L/sec would not provide appropriately for in-stream ecological values, cultural values (including a healthy connecting flow to the Clutha River), recreational values, natural character and amenity values, and have accordingly proposed a minimum flow of 550 L/sec.

5.1.2 Rationing Regime and Group managed water

If the minimum flow is set at 550 L/sec then a Rationing Regime will be implemented by the consent holders to ensure the minimum flow is upheld. Consent holders will be bound by the regime. The Regime will document the flow sharing methodology by describing exactly how the water takes will be rationed to ensure the minimum flow is upheld. In summary as flows start to drop towards trigger levels at the Lindis Peak recorder each of the main stem takes will be reducing their rates of abstraction. The result is that the river flows stay higher all along the main stem as each take leaves a contribution towards the minimum flow. In effect the benefit in the lower river of the gallery

system is further enhanced by a soft stepped flow decrease all along the lower stretch to the Ardgour meter and beyond.

It is expected that rationing would occur at flows of less than 1600 l/s at the Lindis Peak flow site.

A minimum flow of 900 L/s at Ardgour flow site means that sharing will have to be implemented early in the irrigation season and for most of the summer. It is expected that rationing would occur at flows of ~3000 L/sec at the Lindis Peak flow site. In this case irrigators are likely to abstract what they can when the water is available particularly when there a small fresh in the system. The LIC takes (Takes 11 and 12) and The Point take (Take 13) will continue to utilise the existing joint race system to share water, as is practiced currently.

5.1.3 Nature of take patterns

The hydrology of the Lindis River and tributaries is characterised by higher winter and early spring flows and very low summer flows. Summer rainfall events are not as common as in other area of Otago. The tributary flows are a more pronounced example of this flow pattern as described in Section 10.4. Irrigators have adapted to this water availability pattern by abstracting the water while it is available and then reducing back some of the area irrigated later in the season as the flow drops off. With that pattern in mind we have asked to maintain the rates of take so opportunistic irrigation abstraction is possible. The annual volume limits will ensure an efficient amount of water for the area irrigated is abstracted.

We also seek a monthly limit that is the equivalent of abstracting continuously so that irrigators are able to abstract when the water is available. The residual and minimum flows will protect in stream values and the annual volume will be sure only an efficient amount is abstracted.

5.1.4 Lindis Community

Many families have lived in the catchment for several generations and value the strong community and unique landscape. Maintaining their businesses as viable enterprises is very important to the Lindis families so that farm succession can be achieved and their children, grandchildren and great grandchildren can enjoy life in the catchment.

All farms in the Lindis Catchment are family owned and operated businesses. There are a range of farm sizes from small lifestyle blocks that have small vineyards or orchards and one home, to farms that support one family and no employed workers, to larger farms where both the parents and adult children are farming together with the support of farm staff.

6. Overview of water use in the Mid-Lindis Catchment.

The water users in the mid-Lindis Catchment (from Station Creek to above Cluden Stream) confluence, will continue to abstract their water from the same intake sites.

Irrigation has been an integral part of farming businesses in the Lindis Catchment for close to one hundred years. The Beggs Stacpoole water permit was issued in 1886 and the water for The Point issued in 1909. The infrastructure that has been developed and maintained, the operational management, the feed produced, and ongoing upgrades demonstrate a clever and efficient use of a shared community resource.

In general, farms in the Mid-Lindis catchment and the larger farms in the Ardgour Valley are dryland operations with a portion of irrigated land. Mid Catchment Lindis farmers are primarily meat and wool producers, growing pasture and crops to feed cattle and sheep.

The production capacity of the farms is directly related to the quantity and quality of stock feed the property can produce. The production from the large dryland portion of the farms is determined by climatic conditions, mainly the rainfall pattern, soil temperatures and sunny or shading facing slopes.

Figure 11: Stock on a dryland area (left) versus a irrigated pasture area (right) on Geordie Hills

The irrigated land is vital to the success of the farming businesses, as those are the only paddocks that provide a reliable feed supply. Irrigation provides an annual volume of stock feed that is almost guaranteed. Without this reliable portion of the annual feed supply, farmers must take a much more cautious and more reactive approach to stock management.

The irrigated paddocks of the farm give the farmers the feed to carry breeding stock through winter, finish lambs and cattle to prime weights and generally reduce risk and plan more for the year ahead.

The farms are all in various stages of efficiency upgrades.

An overview of the water takes from this part of the catchment is provided in Table 7. Refer to Appendix C for photos of intakes for these takes.

Figure 12: Mid- catchment irrigation command area including - Yellow: Emmersons; Green: Geordie Hills

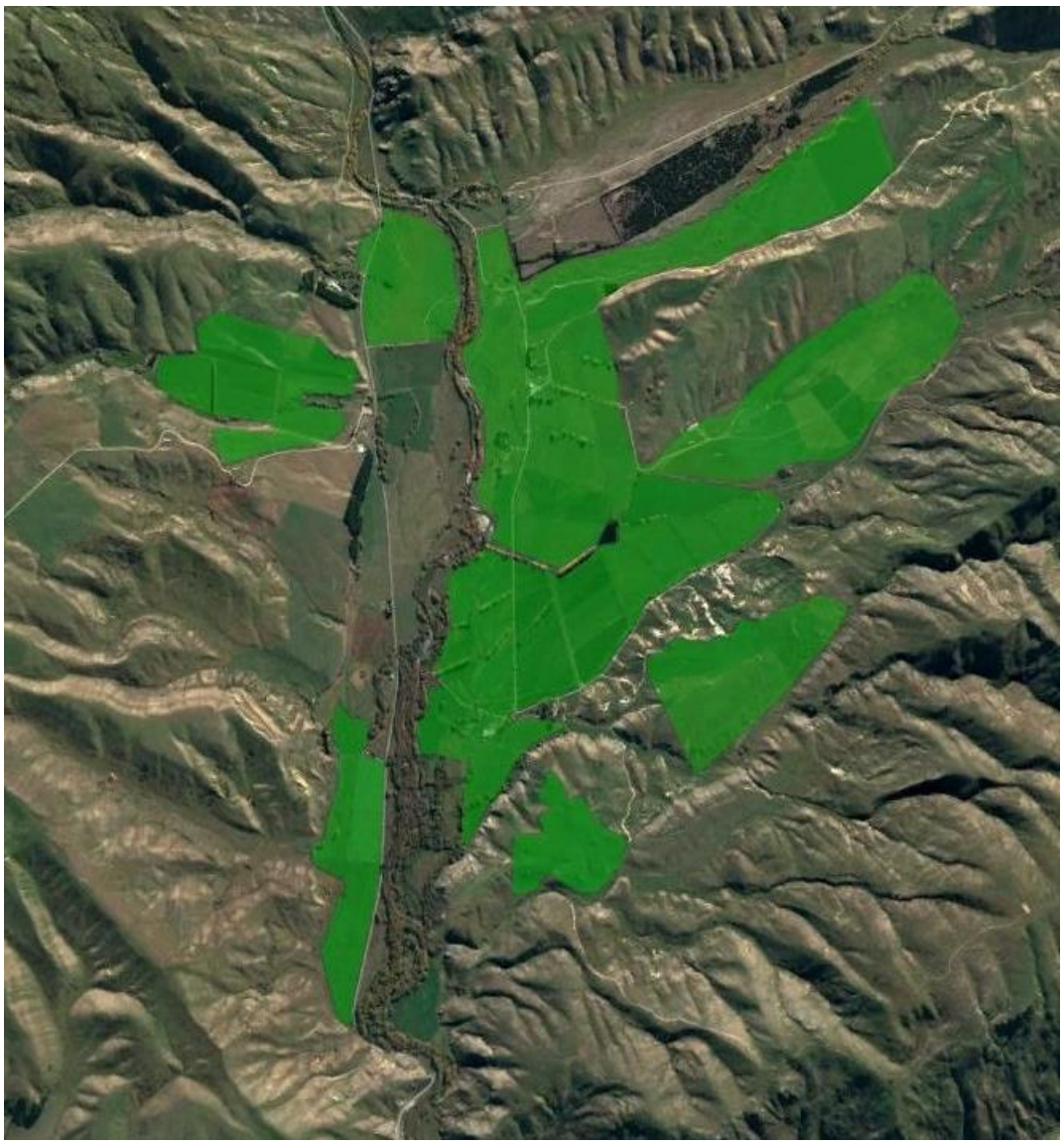

Figure 13: Mid-catchment irrigation command area including: Longacre; Nine Mile; Lindis Downs; Timburn Station; Cluden Station area

Table 7: Overview of water takes from Mid Lindis Catchment

Take Point	Primary (P) or Supp (S) allocation	Source	Consent number	Current consented rate L/sec	Max Recorded Rate of Take	Proposed rate L/sec	Current consented volume, m^3	Max Recorded Annual Volume (m^3)	Proposed volume m^3
1.	S	Station Creek	96196	111	n/a (hasn't been used)	100	3,504,000	n/a (hasn't been used)	810,000
2.	S	McKenzie's Creek	99298	55.6	n/a (hasn't been used)	56	1,752,000	n/a (hasn't been used)	
3.	P	Rocky Creek	96638.V2	55.6	111	111	1,752,000	1,042,806 (corrected data)	1,215,000
4.	P	Long Spur Creek	96637.V2	55.6			1,752,000		
5a.	P	Lindis River	99022.V1 Timburn	166.6	413	101	3,110,000* (based on monthly limit)	1,536,535	2,227,500 (combined with 7b)
b.	P		99329.V1 Timburn	83.3					
c.	S	Lindis River	99328.V1 sup Longacre	56		56	251,100	251,100	251,100
d.	P		99062.V1 Longacre	166.6		151 with Tim Burn Creek ≤ 28	2,073,000*	1,877,988	2,323,187
e.	P		2008.361 .V1 Longacre	56.6			1,142,000		
6.	P	Tim Burn	97059.V2 Longacre	39.5	35		1,246,000	108,412	
7a	P	Cluden water delivered via Coal Creek	96077.V1 Longacre	From Cluden: 6.94 From Coal: 6.94	83	84	216,000*	336,787	
7b	P	Cluden water delivered via Coal Creek	99021.V1 Timburn	From Cluden 76.3, From Coal: 76.3			2,376,000*	2,199,575	within the 2,227,500m^3 as specified for 5a and b above

*Based on monthly limit x 12 months (no annual volume currently specified for these consents).

6.1 Emmerson Family, Forest Range

Water rights

Take Points 1 Consent 96196 and Take Point 2, Consent 99298

Water use

The Emmersons are high country pastoral farmers. They breed merino sheep on their 18500ha property. They own two water rights, one on the home property Forest Range and the second on Bargour Station. Previously both these water rights had been used to irrigate the lower terraces along the road side. Open races and border dykes are in place across approximately 100ha.
Take Point 1 on Station Creek has a small pond for storage that was established a long time ago. The creek runs through the dam and back into the gully. All water bypasses once the dam is full. The Emmersons are considering options to utilise the storage further. At the moment it is completely for recreation use such as swimming and canoeing.

Station Creek flows through the homestead yards area and is part of an attractive park setting. The Emmersons watch trout enter to spawn in this area.

Figure 14: Station Creek entering and leaving the pond on Emmerson's.

Outcome sought

The Emmersons request to replace both the water permits as supplementary permits, in order to ensure that an appropriate flow remains in these Creeks over summer. The storage on Station Creek offers opportunity for enlargement and supplementation of the irrigation to the lower terraces.

They seek to take the water at a rate up to 100L/sec at Station Creek and 55L/sec at McKenzies Creek with a total maximum volume from both take points of 810,000m³.

The purpose of use is to include hydro generation as the Emmersons are considering installing a small scheme for personal use.

Table 8: Allocation sought for Take 1 and Take 2

Source and Take	Hectares	Rate of take	Volume as per Aqualinc	Volume requested	Residual flow proposed
Station Creek - Take 1	100ha	100L/sec	810,000m³	810,000m³	20 L/sec
McKenzies Creek - Take 2		55L/sec			15 L/sec

6.2 McCaughan Family, Geordie Hills

Water rights

Consent 96638.V2, Consent 96637.V2

Water use

The McCaughans own and manage Geordie Hills Station as a sheep and beef operation. It is 2090ha in total with 150ha of irrigation on the homestead flats area. The McCaughans have been upgrading their irrigation application methods since 2004. They have decommissioned border dykes and added two centre pivots and a hard hose gun.

Figure 15: Preparing cut pasture for silage (left) and preparing cut pasture for silage (right)

The water from the two Take points, 3 and 4, is conveyed by open race to a combined race and is then measured on the upper terrace at the one site. The water use data is for the two takes combined.

The water then goes to a small holding pond. Since the tributary supply can be quite variable and drops off during the summer the storage pond helps provide a buffer of supply to keep a pivot or gun working for a set period. Without the pond the small amounts of water through summer wouldn't be used as efficiently.

Figure 16: Lamb marking (left) and cattle on a pivot irrigated paddock (right)

Water use records

The measuring equipment on the water take is managed by Boramans with the data directly telemetered to the Boraman website. Water take data has been collected for 4 years. The records show that the maximum rate of 111L/sec is taken on occasion when the flow allows. Allowing for error corrections the maximum volume estimated to be abstracted is 1,042,806m³. Given that there is only four years of data we request a slight increase in total volume on the max recorded at 1,215,000m³ which is equivalent to an efficient amount for the 150ha irrigated.

Table 9: Water use data for Takes 3 and 4

Year	Max rate of Take (L/s)	Annual volume (m^3)
2013 – 2014	115.3 **Note.** No data recorded from 01/07/2013 – 19/11/2013).	694,391# After correction 1,042,806
2014 – 2015	152.8 **Note.** Took out 199.2 l/s.	928,440
2015 – 2016	120.8	767,683*
2016 – 2017	143.3	755,765"

#water take was on but the measuring equipment wasn't fully functioning up until mid- November. Boraman had equipment functioning by mid November. A letter from Borman's will be supplied as proof. To replace missing numbers we have added a conservative 49L/sec rate sourced from the data collected in following years for missing data to get estimated total abstracted
∗less than total abstracted as measuring equipment was faulty and service provider wasn't able to visit promptly
"wet season meant less reliance on irrigation

Outcome sought

The McCaughans request to keep the combined rate take of take at 111L/sec from the two creeks with a maximum volume of 1,215,000m³.

There are 2 water measuring exemptions (referred to as WEXs) to measure away from the points of take. The current measuring site and WEX will remain in place under the new permit. The McCaughans are investigating the option of a small hydro power station, within the allocation limits sought.

Table 10: Allocation sought for Take 3 and Take 4

Source and Take	Hectares	Rate of take	Volume as per Aqualinc	Volume requested	Residual flow proposed	WEX
Rocky Creek Take 3	150ha	111L/sec	1,215,000m³	1,215,000m³	None	WEX0038
Long Spur Take 4					None	WEX0037

6.3 Davis Family, Longacre Station Ltd

Water rights

Take points 5: Consent 99062.V1, 2008.361v1, 99328.v1 Take point 6: Consent 97059v2 Take point 7: 96077.v1

Water use

The Davis family own and manage Longacre Station which has 2930ha dryland supported by 303ha of irrigated paddocks. It is a sheep and beef operation that has been in the family for 3 generations. Tim and Julianne's young boys are the 4th generation. The Davis' have been implementing a plan to upgrade to spray irrigation for many years. There are already 3 pivots on the property. One of the pivots is a small moveable pivot that can cover 4 different paddocks. A hard hose gun and k-line are

also used. There are also areas of border dyke that are planned to be upgraded to spray after these permits are replaced.

Figure 17: Tim Davis and his sons in 2013

Figure 18: Pivot using Timburn Creek water

Longacre Station Ltd uses water from the Lindis River and two tributaries, the Timburn and Cluden/Coal Creeks.

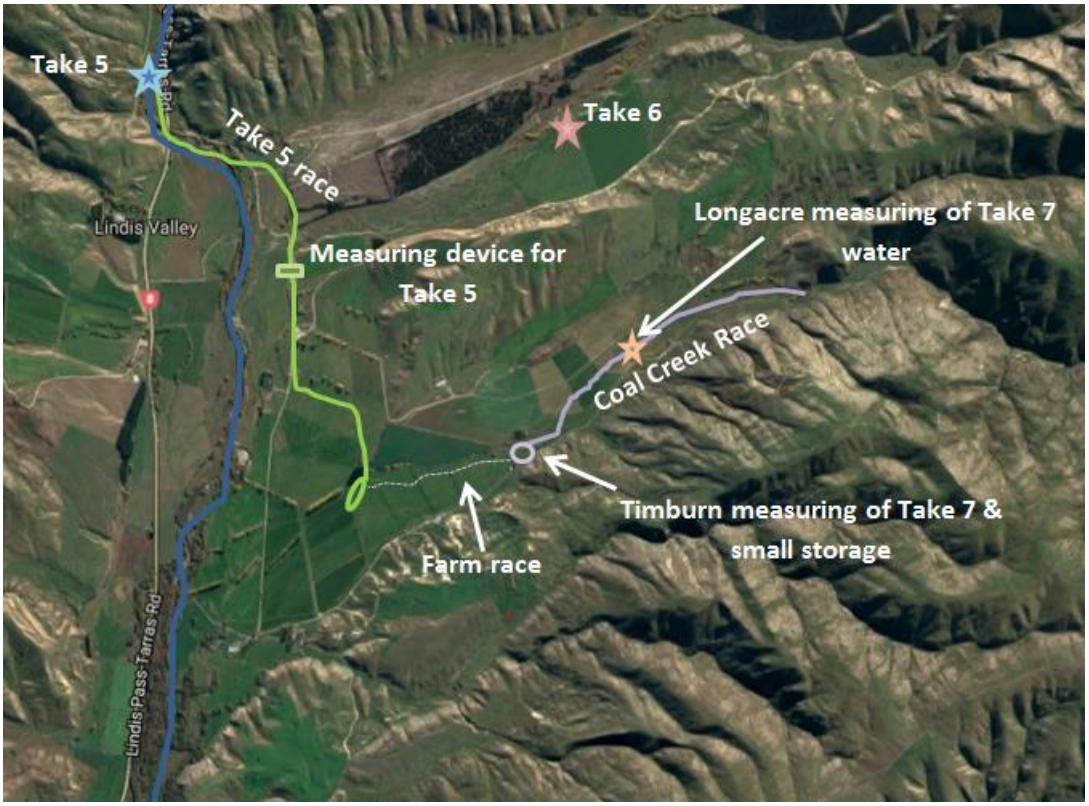

Figure 19: Schematic of Longacre and Timburn takes, races, and measuring sites.

The Lindis (Take point 5) and Cluden/Coal (Take point 7ab) abstraction sites are shared with their neighbours, Timburn Station. The Lindis water (Take point 5) is conveyed in an open race to Longacre and then onto Timburn Station. Longacre Station and Timburn Station also have

supplementary takes from the Lindis River at Take point 5. The measuring data from Take point 5 includes all 5 permits.

Water use records

Boraman Consultants maintains all measuring sites and will continue to do so.

Table 11: Longacre water use data

	Take point 5. Lindis River			Take point 6. Timburn Creek		Take point 7. Cluden Coal Creeks	
Year	Max rate (L/s)	Total annual volume (m^3)	55% of total which is Longacre's share	Max rate L/sec	Annual volume (m^3)	Max rate	Annual volume
2012 -2013	413 Dates inclusive (15/11/2012-30/6/2013)	3,414,524 Dates Inclusive: (16/11/12 – 31/05/13)	1,877,988			31.8	85,146 Negative readings removed
2013 – 2014	341	2,955,637	1,625,600	30.3	41,999	41.7	172,434 Negative readings removed
2014– 2015	302.49	2,365,702	1,301,136	35	62,876	39.6	258,097 Volume data missing
2015 – 2016	360.17 l	2,203,150	1,211,708	33.9	108,412	25.3	75,276
2016 - 2017	364.96	3,255,838	1,790,711	31.7	75,276	36.2	336,787

The purple shaded boxes indicate the maximum volume per intake site. The total of maximum volume recorded for Longacre water as the combination of the three takes is 2,323,187m^3, and this is the amount sought for the replacement permit. Longacre irrigates a total of 303 hectares. This is less than 2,454,300m^3 calculated as an efficient volume for irrigation based on 8100m^3/ha/year.

Longacre have used their supplementary take on occasion as the data shows.

Longacre supports three families including the family of its full time manager. They also employ one full time worker.

Outcome sought

The Davis family are seeking a combined total volume for the water from the Lindis River, Timburn Creek and Cluden/Coal Creek takes as all water is used in combination on the farm. Each point of take will have a maximum rate and the combined total volume will ensure only an efficient amount of water for the total irrigated area can be abstracted.

Lindis River and Timburn Creek: 151L/sec together with no more than 28L/sec from Timburn Creek.
Cluden/Coal: An abstraction rate of 7L/sec.

Take location: The abstraction for Timburn Creek is taken from an intake site that is further upstream from the site specified on the consent. The current location of the intake site is specified in Table 2. The new point of take is G40 363 011 or NZTM2000 1326351 E 5039359N.

The Davis family would also like a second site option further upstream to utilise gravity for delivery. This is to future proof if a dam was to be put in where the system would then run on gravity. An access agreement would need to be negotiated with neighbours. The second site option is G40 368 014 or 1326816E 5039748N.

Given that Longacre Station and Timburn Station share an intake structure and race on the Lindis River the consents will have a connecting condition that limits their rate of take and volume to the maximum of both permits together. The monitoring equipment covers both takes and will continue to do so. Dave Boraman installed and maintains the measuring equipment. The data is telemetered to a website.

A significant amount of investment has already been made in efficient irrigation on Longacre, and by 2020 all irrigation will be spray irrigation, except for one area of 15ha which will continue to be border dyked using supplementary allocation water.

Longacre also request the re-issue of the supplementary water, with a reduced supplementary minimum flow from the current 4100 L/sec to 1600 L/sec, to make it consistent with the supplementary flow set by Plan Change 5A.

Table 12: Allocation requested for Take 5, 6 and 7

Source	Longacre			Timburn Station				
	ha	Rate L/sec	Annual Volume m³	ha	Rate L/sec	Annual Volume m³	Residual	WEX
Lindis River	303	151 with Timburn Creek≤ 28	2,323,187	275	101	2,227,500	N/A	WEX0069
Timburn Creek							None	
Cluden/Coal Creek		7			77		Cluden 5L/sec Coal no residual	WEX0220
Lindis River supplementary		56	866,700		N/A	N/A	N/A	

6.4 Lucas Family, Timburn Station

Water rights:

Take point 5 consents 99022.v1, 99329.v1 and Take point 7. Consent 99021.v1

Water use

Timburn Station (referred to as Timburn) is a family run property. Parents John (known as Tussock) and Ann Lucas currently hold the consents and their son, Sam Lucas is managing the property with his young family. The property is 5500ha in total with 160ha of irrigated land. The Lucas' graze cattle and sheep to produce meat and wool.

Timburn has two sources of water, the Lindis River and the Cluden Stream. Both takes are operated in co-operation with Longacre Station. The take on the Lindis River at Take Point 5 races water around to Timburn. Take Point 7 on Cluden Stream races water to Coal Creek where it is discharged and the same amount abstracted further downstream from Coal Creek.

The water is currently applied using border dykes however once the consents have been reissued a programme of upgrades to spray systems will be started and a further 115ha of land on the terrace will be spray irrigated using the current water abstracted.

There are two storage ponds on Timburn that are used to store water for irrigation. A small one takes all the Cluden Coal Creek water and a larger one stores some of the Lindis water. The smaller one will need to be shifted as high voltage power lines pass overhead and the power company does not allow storage ponds under their wires.

This storage shift is another upgrade task that will be completed once the permit has been replaced.

Figure 20: Border dykes on Timburn Station

Timburn and Longacre share the same measuring equipment at Take point 5. Timburn's allocation amounts to 45% of the water measured through this equipment. Timburn also share the water abstracted at Take Point 7 but their share is measured separately to Longacre Station.

Water use records

All water data is serviced and displayed by Boraman Consultants.

Table 13: Water use data for Timburn

	Take point 5. Lindis River			Take point 7. Cluden/Coal Creeks	
Year	Max rate (L/s)	Total Annual volume (m^3)	45% which is Timburn Station's share	Max rate (L/sec) [1]	Annual volume (m^3) [2]
2012 -2013	413 Dates inclusive (15/11/2012-30/6/2013)	3,414,524 Dates Inclusive: (16/11/12 – 31/05/13)	1,536,535	83	
2013 – 2014	341	2,955,637	1,330,036	83	749,355 **Note.** 10 negative readings were deleted
2014– 2015	302.49	2,365,702	1,064,566	83	814,105
2015 – 2016	360.17 l	2,203,150	991,418	83	667,141
2016 – 2017	364.96	3,255,838	1,465,127	83	2,199,575

1. *As the water meter measured the whole drain that then entered the dam until March 2017 we have capped the rate at the consent maximum.*
2. *To calculate annual volume we assumed all water that entered the dam from Oct to April was used. The rest went straight through.*

Outcome sought

The Lucas' request that all consents be replaced. They would like to have a combined total volume for their two points take and a linking consent condition with the Longacre consents for both the Lindis and Cluden/Coal water.

The rate of take for the Lindis River water (Take 5) would be 101L/sec. The rate for the Cluden/Coal water Take 7) is 77L/sec. The total volume calculated on 275ha is 2,227,500m³. This volume is within the maximum abstraction recorded.

7. Overview of water use in the Lower Lindis Catchment

The land use in the lower Lindis catchment, below the Cluden confluence, is much more varied than the mid catchment area. There are larger farming enterprises mixed with small lifestyle blocks, orchards and vineyards. The water is primarily used to grow pasture and much smaller areas of grapes and horticulture. Some of the paddocks of the smaller lifestyle blocks are leased to farmers who irrigate pasture and graze livestock.

The small blocks are located close to the Lindis River along the Ardgour Valley and in and near the Tarras township. Refer to Appendix C for photos of intakes associated with the existing takes.

Table 14: The current points of take being replaced in the Lower Catchment and surrounding Tarras

Take point	Primary (P) or Supp (S) allocation	Source	Consent number	Current consented rate (/s)	Max recorded rate (l/s)	Proposed rate		Current consented volume (m^3)	Max recorded annual volume (m^3)	Proposed volume (m^3)	
						900	550 (total after 5 years)			900	550 (total after 5 years)
11	P	Lindis River (Tarras main race)	2001.807v2	1274	1122	1120	96	40,270,000	18,886,748	13,770,000	1,710,720
12	P	Lindis River (Ardgour race)	2001.809v1	707.5	597	600	284	22,372,000	7,558,796	6,480,000	4,469,601
13	P	Lindis River Rutherford	96066	333.3	333	295		10,512,000	5,562,227	4,090,500 (including supplementary take)	
14	P	Waiwera Creek at two points	96967.v2	55.5	42	42 primary		1,752,000	238,386		
	S					120 supplementary					
30	P	bore	2003.186.v1	0.83	0.35	0.83		26,000	7260		
15	P	Lindis River	2001.544.v1	138.8	77	100		768,000	352,514	1,053,000	

Take point	Primary (P) or Supp (S)	Source	Consent number	Current consented rate (/s)	Max recorded rate	Proposed rate	Current consented volume	Max recorded annual	Proposed volume (m^3)
16 shifts to B1	P	Lindis River (Beggs stackpoole)	WR1753CR WR778796CR	100.6 (this has educed from ~260 l/s)	257.49	10	Not specified on consent	2,508,420	145,800
17	P	Shepherds creek	2000.690	27.78	28	28	864,000	257,122.8	260,000
18	P	Ribbon aquifer bore	2001.995	20	20	25	414,700	179,475	364,500
31a	P	Cluden swamp retake	2003.110	555.5	619	555.5 (for 5 years only)	1,440,000 (subject to take within quota from another location)	2,798,453	
31b	P	Cluden swamp	2006.254.v1	14	No meter	30	72,000		567,000
31c	P		2003.251.v1	22	30		696,000		
32	P	Unnamed Spring	2001.546	26	26	26	808,800	219,397	299,700

7.1 Lindis Irrigation Company

Water rights

Take 11 (Tarras Race): Consent 2001.807v2, Take 12 (Ardgour Race): Consent 2001.809v1, Take 31a &b (Cluden Swamp) Consents 2003.110, 2006.254 and Take 30 (Bore near Ardgour Bridge) Consent 2003.186

Water delivery

The Lindis Irrigation Company has 37 shareholders throughout the Lindis catchment area. Two main races deliver water to these shareholders.

The irrigation scheme is completely reliant on gravity to deliver the water through an extensive network of historic water races. The water arrives on farm either above or mid farm so that gravity systems such as border dykes and contour flood have historically been used to run the water over the paddocks. This system is incredibly energy efficient however the losses in the races and the maintenance requirements of the races create other inefficiencies. Upgrades to spray application methods have been introduced on some farms. Many others have been waiting for the outcome of the minimum flow process so that they would know the type of irrigation system to invest in based on the reliability of supply that would result from the minimum flow.

LIC have two main race systems, the Tarras Race and the Ardgour Race with a total race system some 55km long. Both abstract water higher in the catchment so that gravity can be used to convey water. The Tarras race delivers water to shareholders in the broader Tarras township area and to the north and west of the river.

Figure 21 shows the current race locations

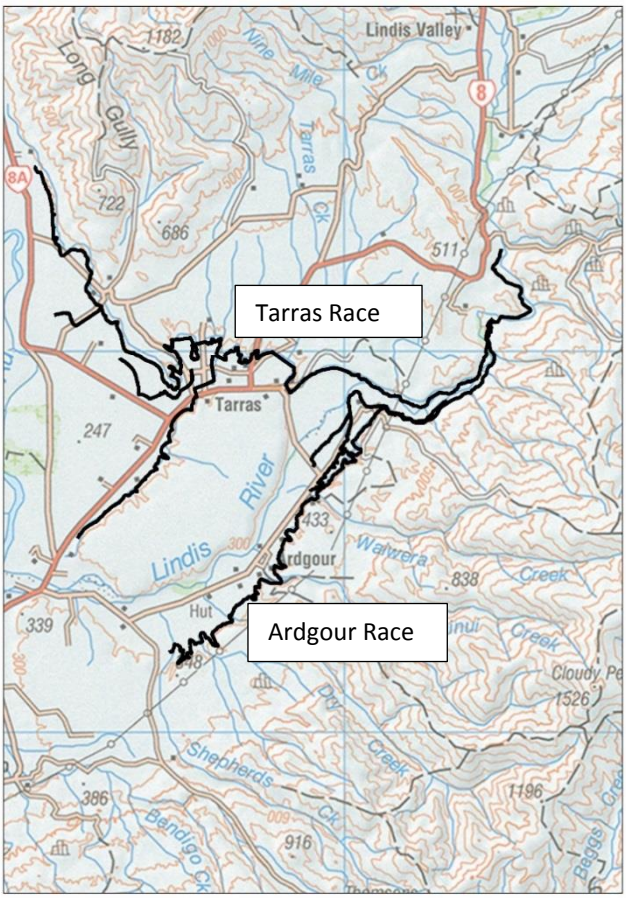

Figure 21: LIC Tarras and Ardgour Race and Rutherford Race routes

As the delivery and application of the water from the two company races relies on gravity the bulk of the area irrigated (the 'command area' of the scheme) sits below the race. Except for a few paddocks about where the Tarras Race word is on the map where some farmers pump water above

the race. The current command area of LIC is 2,500ha (800ha from the Ardgour race and 1700ha on the Tarras Race).

Water use

The water is primarily used to grow pasture for livestock feed. Similar to the mid catchment, farmers use the small amount of irrigation to supplement a larger dryland operation. Irrigated pasture or Lucerne is cut for hay or baleage and fed out during winter.

The size of the farms varies greatly with some smaller farms that support just one family with extra income earned off the farm to larger operations where 2 generations of a family are supported by the farming business.

There are small block owners in LIC. The land use on these blocks includes pasture for grazing, vineyards, and horticulture.

These races have provided valuable irrigation water via cost effective conveyance and application systems in a very dry catchment. Some of the Tarras town houses, the community hall and firefighting service have relied on LIC water. Many of the local domestic bores are believed to be sustained by the network of races and border dyke irrigation. However the races are now in need of considerable maintenance to meet modern efficiency standards. The ORC's Plan Change 5A (Lindis minimum flow) excludes the Tarras area from the Lindis catchment and some of the shareholders (including a number located in the Tarras area) have invested heavily in a more reliable water supply from the Clutha. The Clutha River water is piped and pumped and comes at a significant cost. To date some of the LIC shareholders have balanced their budgets by using a combination of both Clutha and Lindis River water.

This situation has forced the irrigation company to consider the future of water delivery for their shareholders, while taking into account the health of the Lindis River and the complexity or requirements of any change.

This application, including the dis-establishment of these races, represents LIC's preferred proposal for the future, as it would result in significant gains in efficiency. There is considerable change, cost and negative consequences in implementing the proposal but it is believed to give the best outcome for the river while moving towards efficient irrigation.

Water use records

Both water consents have metered data collected since 2006. Boraman Consultants is the service provider and the data is displayed on its website.

Table 15: LIC water metering records for Takes 11 and 12

Year	Take point 11 Tarras Race		Take point 12 Ardgour Race	
	Max rate L/sec	Annual Volume m^3	Max rate L/sec	Annual Volume m^3
2013 – 2014	1121.9	18,572,889	495.2	7,558,796
2014 – 2015	1081.4	18,136,470	546.9	6,890,161
2015 – 2016	1056.1	17,757,695	525.7	6,673,346
2016 – 2017	1022.9	18,886,748	597	6,799,493

Other water permits

The Lindis Irrigation Company hold two consents that cover the conveyance of the Tarras Race water through a natural water course locally known as Cluden swamp (pursuant to Consent 2006.254 and 2003.110). Note that these consents had measuring devices for a short period to prove compliance with consent conditions but the water is actually re-take of the Tarras Race water. The water was measured automatically for a number of years to prove that only the water discharged from the race was retaken. The ORC Compliance team have since agreed that an annual manual record of this retake is all that is required.

The Lindis Irrigation Company also holds a permit for a bore that supplies a collection of houses, (Consent 2003.186, Take point 30).

Table 16: LIC water metering records for Take point 30

Year	**Rate L/sec**	**Annual volume m^3**
2008 – 2009	0.158	4160
2009 – 2010	0.23	4984
2010 – 2011	0.3	5684
2016 – 2017	0.35	7260

LIC Area irrigated

LIC's existing command area is shown in Figure 22 below, while the proposed command area for the lower Lindis (with a minimum flow of 550 L/sec) is shown in Figure 23.

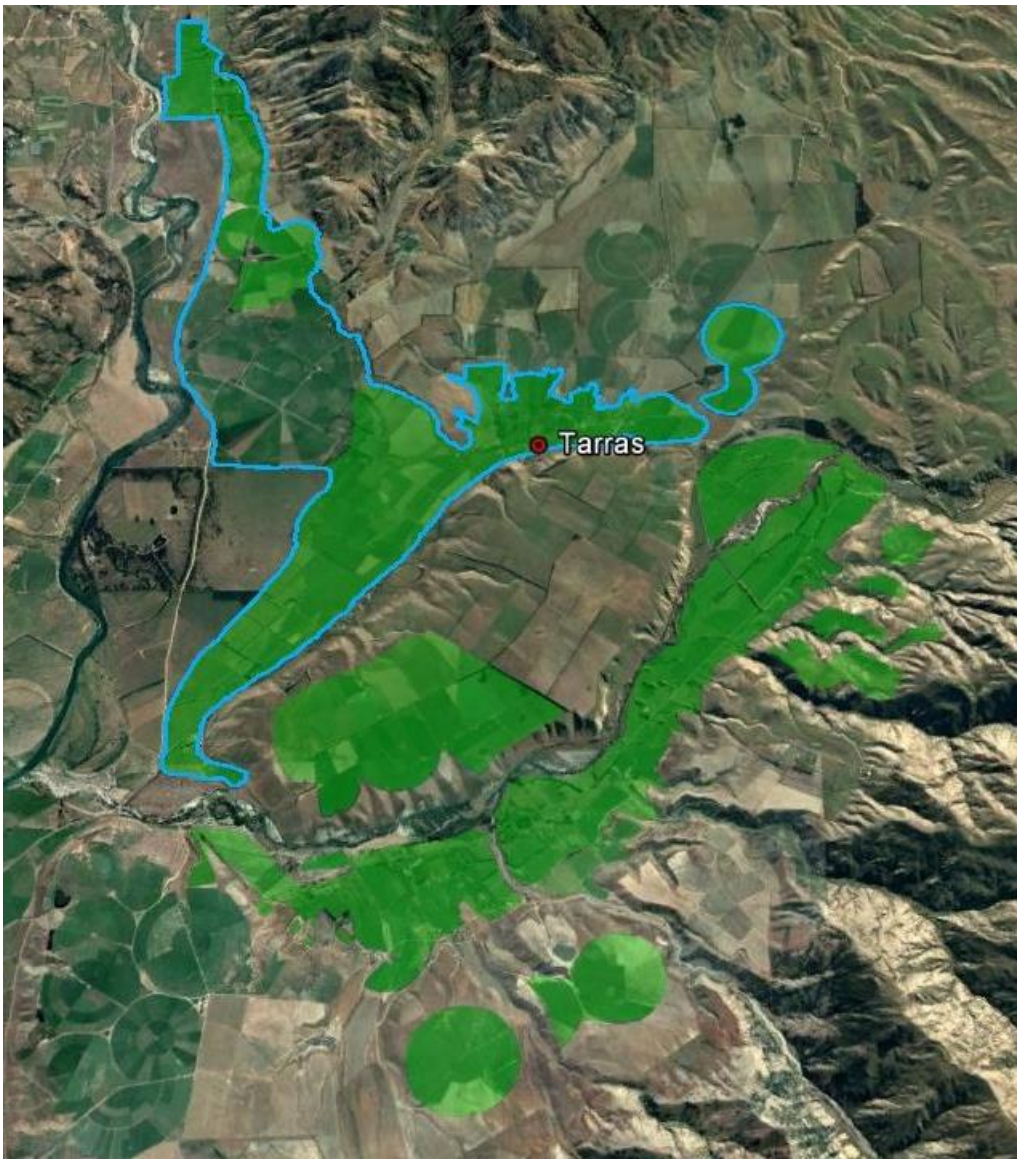

Figure 22: LIC current irrigated area. Historically all of the green shaded area plus all of the area outlined in blue were irrigated with LIC water.

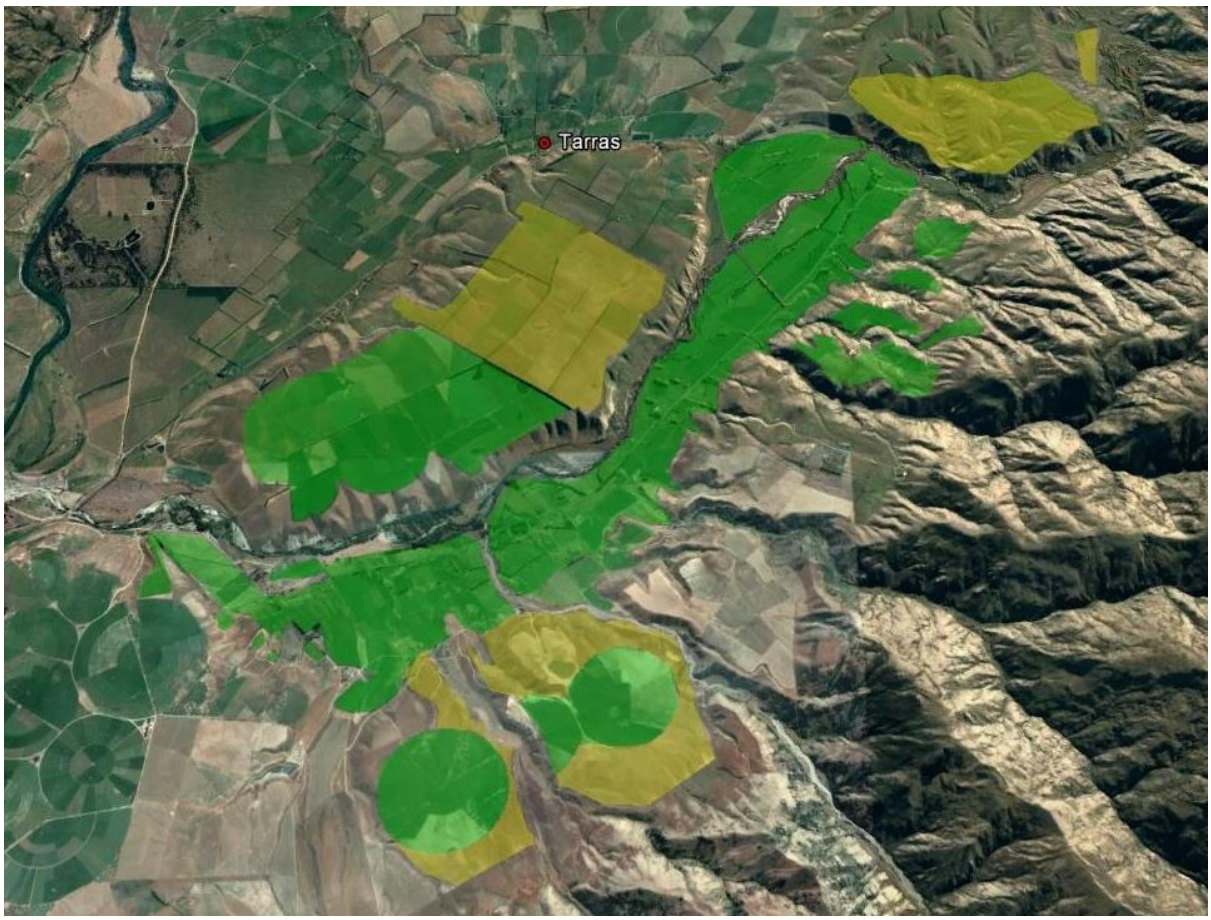

Figure 23: Proposed Lower Lindis Command area under 550L/sec (currently irrigated area shown in green, new areas proposed to be irrigated shown in yellow – note that these include areas irrigated with supplementary allocation water).

7.1.1 Water sharing by LIC

The four larger intakes in the lower Lindis River work together to share water, particularly during low flows. The sharing is done in two ways, firstly some of the flow is left in the river for the other takes and secondly, further flow is returned to the river just above the intake for the next take. By-washing or returning water back allows for a finer management of the resource. The race man can see what was initially taken and can then deliver more or less to the next take to achieve the nominated rostering regime whether it be 25%, 50% or 75% cutbacks.

Once the permits are replaced all Lindis Catchment takes that are subject to the minimum flow will work together to uphold the minimum flow. That includes all the new gallery takes that will replace the larger LIC races.

Water sharing is explained in more detail further in the application.

7.1.2 Outcome sought by LIC

The future options of LIC shareholders depend completely on the resultant minimum flow decision. The irrigators have a proposal that requires a huge amount of change to all aspects of irrigation water management.

The proposal in this application can only go ahead if a 550L/sec or lower minimum flow is adopted through Plan Change 5A to the Regional Plan: Water for Otago.

The cost of the change is significant and farmers will be seeking financial support from their banks to make it a reality.

It is important to note that even with a minimum flow of 550 L/sec some of the LIC irrigators will not be able to afford the changes and/or will no longer be able to irrigate as they will no longer have access to the Lindis water. Their properties are too far away from a water source and their business model would not have resulted in a sufficient margin to afford the infrastructure.

All LIC shareholders that retain their company water will be paying a much greater annual cost to deliver the water as gravity will no longer be utilised and the power to transport the water from the source to their farms will be an ongoing annual cost.

The community is at a cross roads and every-one has needed and still needs time to plan, implement and complete the change.

7.1.2.1 If the minimum flow is set at 900L/sec

At a 900L/sec minimum flow, the reliability of the irrigation water is approximately 78%. This is too low to invest in the proposal put forward in this application. The low reliability of irrigation water would result in expensive irrigation equipment sitting idle in paddocks as the access to water decreased during the dry summer months. The production from the paddocks would decrease significantly for all Lindis Catchment irrigators.

Poor water reliability will result in many cases where it will not be possible to finance efficient irrigation infrastructure as the production returns are too risky. If sufficient water is not available for abstraction during the peak of the growing season then the investment in expensive infrastructure cannot be justified. Modern irrigation equipment is designed to be used continuously, applying just enough water. If it is used intermittently then production of pasture declines or is placed at risk of failure.

The costs of the new pumping and piping infrastructure of the chambers for the gallery intakes and the on farm irrigation equipment will be very high. For example the equipment and costs for the construction of one gallery to pump 22L/sec and connect to an existing k-line system in the Ardgour Valley is detailed below by irrigation designers Irritech Otago Ltd:

- Drill Bore
- Test Pumping
- Bore Pump
- Rising Column pipe and Headworks

- Water Meter and Telemetry
- PVC pipe and control cabling to existing site
- Road Crossing
- Trenching and Install
- Tank at existing race pump site
- Plumbing and rework at existing race pump site
- Power Cable from road to bore site
- Upgrade existing transformer
- Upgrade existing switchboard
- Electrical controls for pump

Total cost estimated at best case is $140,000 + GST and possibly as high as 170,000 + GST.

This investment of $140,000 to $170,000 will not result in dryland paddocks becoming irrigated but will be spent simply to continue irrigating.

If the minimum flow is **greater** than 550L/sec then the reliability of water (less than approximately 89%) is such that the change cannot occur and the LIC irrigators will have to keep using the old races. The Tarras and Ardgour races and their intakes will remain, and the splitting up of these 2 large points of take (with associated large rates of take) into several smaller gallery intakes will not proceed. This means that water would still be gravity fed to properties, rather than being replaced with piped methods of conveyance from the proposed gallery intakes. Both of the races would require maintenance to keep them functioning and improve the efficiency of conveyance. This will be done on a staged basis as shareholders can afford it.

This is not LIC or LCG's preferred outcome. It will not result in gains in efficiency of use and transport, or the improved wellbeing of a greater length of the Lindis River that is possible under the proposal put forward in this application but it will be the only choice if 900L/sec is the minimum flow. At a minimum flow of greater than 550L/sec the surety of supply is too low to fund the change required.

Unfortunately there will be flow on effects to other consent holders if the races aren't closed down. The Ardgour race travels through paddocks on The Point that are currently irrigated using border dyke. This property has plans to close their own race, move to a gallery to abstract directly from the ribbon aquifer and improve application methods in the paddocks where the Ardgour race would be closed. These plans would also be cancelled if the Ardgour Race remains as it subdivides these paddocks. The surety of supply would also impact on The Point's ability to upgrade as discussed below.

Under a minimum flow of 900 L/sec the two existing intake sites would be replaced at the current locations. The rate of take will remain so that irrigators can access the higher flow for the shorter duration when water is available. The irrigators will be forced to irrigate when the water is available rather than when the water is needed as the soil moisture is close to wilting point.

The command area would remain as the current command area of 2,500ha. The total volume requested would be less than has been abstracted (just over 26,445,544m^3) at 20,250,000m^3. This reflects LIC shareholder's commitment to improving the efficiency of use of water.

The consents required to convey the water through the Cluden Swamp will need to be replaced. The community household bore permit will be replaced as well.

7.1.2.2 If the minimum flow is set at 550L/sec

If 550L/sec is the minimum flow then a complete new intake pattern and irrigation system will be implemented in the lower catchment. The two large LIC races will eventually close and the shareholders who have access to the river will abstract their water directly from the Lindis Ribbon Aquifer through shallow groundwater bores.

This closing of the LIC races, the development of smaller abstraction points along the river and upgrade to pump and spray methodology is referred to as the Gallery Project, and forms a key part of the proposal put forward in this application.

As covered in Section 10.2 the Gallery Project will result in improved flows in the Lindis River from the Cluden confluence downstream. However the implementation of the project is complex and requires transition time. The gallery project involves investigations for appropriate locations for bores, access to power or the introduction of power, design of new irrigation systems, sign off from banks and construction and commissioning of these systems, including conveyance and application infrastructure. The races cannot be 'turned off' until the last of these new irrigation systems is commissioned, otherwise irrigators will be effectively be cut-off during this period. Legal access agreements for the new infrastructure will be required and the closing down of the old historical race system carefully completed. The degree of change that is required was addressed in the evidence of LCG for the ORC hearing on Plan Change 5A.[3]

The draft consents have been designed to enable these changes to carried out within a five year deadline. The LIC replacement consents will be issued to the Lindis Irrigation Company however after all the irrigators have completed their transition to the gallery project the consents will be divided up and transferred to individual or small groups of owners. These transfers would be the subject of a separate application. Eventually the LIC will be dissolved.

Water take rate and volume under a minimum flow of 550 L/sec

The two LIC permits will be re-issued with the existing points of take plus the new gallery project intake locations that the 2 big race intakes will be split up and relocated to.

The existing points of take and correlating volume will have a 5 year deadline. After five years only the new gallery project points of take and the reduced total rate of take and volume remain operative.

[3] Refer to ORC hearing evidence for PC5A of Susie McKeague, Graeme Martin on behalf of LCG and Bruce Jolly on behalf of Lindis Irrigation Company

Table 17: The gallery project proposed take points

Take point	Shareholder	Rates L/sec	Condition	Volume m³	Condition
11	Tarras Race	1120	Total rate of 11 &T1 to T5 ≤ 1120 L/sec until 5 years after issue. Then the total rate of T1-T4≤ 96L/sec (as primary allocation)	13,770,000	Total volume of all points ≤13,770,000 until 5years after issue. Then total rate ≤1,710,720 Supp volume: 4,364,280
T1	Cluden Station-Purvis	56		729,000	
T3	James Smith ex P Jolly	P:20		567,000	
		S:50		810,000	
T2 area	Pukemara-Hayman	P:20		414,720	
		S: 200		2,825,280	
T4	Lindis Crossing	S:50		729,000	
12	Ardgour Race	600	Total rate of 12, A1-A9 ≤ 600L/sec until 5 years after issue. Then total rate of A1-A9≤284L/sec	6,480,000	Total volume of all point ≤6,480,000 until 5 years after issue. Then total rate ≤ 4,469,601
A1	Williams	4.3		64,800	
A2	Cloudy Peak-Rive	23		364,500	
A3	McElrae	4.3		64,800	
A4	Small block owners	10		331,776	
A5	Madill	6		89,000	
A6	Trevathan, B Jolly	P:86 + 64 (150) S: 56		1,255,500 + 1,342,500 S: 925,500	
A7	Cooke	35		437,400	
18	Cooke	5 extra added to existing take		185,025	
A8	Dry Creek Enterprises /Hyndman	8		97,200	
A9	Wainui Station-Rive	38		550,000	

T= indicates that this gallery intake will replace a portion of the water from the Tarras Race

A= indicates that this gallery intake will replace a portion of the water from the Ardgour Race
P=primary
S=supplementary

A new bore is also proposed by the Cooke family, to replace some of the Tarras Race water on their Tomich Hill block. However this application only concerns the construction of the bore, as investigations will be undertaken before a consent application to take water from the bore is prepared. As this bore will be located outside of the Lindis catchment any allocation requested for this bore will not be included in the Lindis catchment primary allocation.

Location of gallery takes under a minimum flow of 550 L/sec

Some of the LIC shareholders who will be transferring their water abstraction to a new gallery intake have already identified a suitable site for the water take. However many shareholders have not located the exact point of take as investigations such as bore testing and impacts on neighbouring bores need to be assessed. This application seeks consents specifying a general location or range for these gallery intake sites, with a requirement to notify the ORC of the GPS location of the intake as soon as it is identified after appropriate site investigations.

Figure 24 and Figure 25 below indicate the locations of the shallow bores proposed by the gallery project. Green stars indicate the take point may move slightly.

Table 18: Location of new gallery intakes

Take point	**Shareholder**	**Located at or within Location Range (NZTM2000)**	**Location Range from NZTM2000 point**	**Legal description of location of water use**
As replacements to Take 11 (Tarras Race)				
T1	Cluden Station-Purvis	1323597 5031025	Within 400m upstream or downstream within Cluden Station land on the Lindis River.	SEC 3 SO 463650 Plus Crown Land*
T3	Kotiti-P.Jolly (becomes Smiths)	1320578 5029181	At Take 15 current point of take or within 200m downstream	LOT 3 DP 483646, LOT 4 DP 483646, LOT 1 DP 483646, Plus Crown land*
T2	Pukemara - Hayman	1317900 5025815	Along the Lindis River boundary of Pukemara property within 400m either side of location point	SEC 6 BLK XV TARRAS SD
T4	Lindis Crossing	1312808 5024716	100 metres to the south east of SH8, to	LOT 1 DP 426163

Take point	Shareholder	Located at or within Location Range (NZTM2000)	Location Range from NZTM2000 point	Legal description of location of water use
			a point located 360m north of the intersection of SH8 and Maori Point Road	
T5	Cookes	Between 1314186 5026239 and 1313605 5025668	Between the NZTM2000 points 50 metres back from the property boundary adjacent to SH8	N/A only applying for consent to construct a bore
R13	Rutherford	1320958 5028548	Within a 300m radius of this point	PT SEC 3 BLK XV TARRAS SD SEC 2 BLK IX CLUDEN SD, RUN 236U
As replacements to Take 12 (Ardgour Race)				
A1	Williams	1318512 5025586	Within a 300m radius of this point	LOT 4 DP 392523
A2 (same site at B2)	Cloudy Peak-Rive	1317752 5024986	At this existing take point for 2007.497 or away from the river further. Within a 400m radius of this existing point	LOT 1 DP 450337, LOT 4 DP 450337
A3	McElrae	131235 5025414	400m radius on Mclrae land	Lot 1 DP375322
A4	Small block owners	1316889 5024395	500 m radius	LOT 2 DP 392523, LOT 1 DP 375322, LOT 3 DP 392523, Lot 1, Lot 2, Lot 4 DP 342832, Lot 2 DP 432876, Lot 2 DP 410980 and Lot 1, 5 DP 432876, Lot 1 DP 300185, Lot 2 DP 432876, Sec 34 Block XVI Tarras SD, Sec 35 Block XVI Tarras SD

Take point	Shareholder	Located at or within Location Range (NZTM2000)	Location Range from NZTM2000 point	Legal description of location of water use
A5	Madill	1316610 5023990	Within 300m radius of this point	SEC 51 BLK XVI TARRAS SD
A6	Trevathan, B Jolly	1316457 5023599	Within the Dry Creek area 400m from point listed (or multiple points)	Lindisvale Trevathan: LOT 1 DP 25202, PT SEC 25 BLK XVI TARRAS SD, SEC 24 BLK XVI TARRAS SD, SEC 50 BLK XVI TARRAS SD Ardgour Station: LOT 2 DP 509332
A7	Cooke	Between 1314453 5022881 and 1314921 5023127	Within a stretch between the NZTM200 points	Lot 2 DP 300805, Lot 4 DP 300395
A8	Dry Creek Enterprises	1316094 5023608	Within 300m radius	SEC 49 BLK XVI TARRAS SD
A9	Wainui Station-Rive	1323597 5031025	Within a 400 m radius of the MRAPA	Lot 2, 5 DP 450337
Replacement of Rutherford, The Point, Race Intake (Take 13)				
R13	Rutherford	1320958 5028548	Within a 300m radius of this point	PT SEC 3 BLK XV TARRAS SD SEC 2 BLK IX CLUDEN SD, RUN 236U
Replacement of Beggs Stacpoole Race Intake (Take 16)				
B1	Lindis Crossing Vineyard	1312671 5023499	Within a 400 m radius from this point	LOT 1 DP 311352 Blk XIV SO 24642
B2 (same site as A2)	Cloudy Peak-Rive	1317752 5024986	At this existing take point for 2007.497 or away from the river further. Within a 400m radius of the existing point	LOT 1 DP 450337, LOT 4 DP 450337

**No legal description available via Land Information NZ, will be requested from DOC and supplied to ORC*

An additional bore will be constructed for Take R13 (to replace the Rutherford's open race intake).

All of the gallery intakes listed in Table 18 above will be constructed outside of the bed of the Lindis River, but will be located within the Lindis Ribbon Aquifer as mapped by Plan Change 5A, except for T5 which will be located outside of the Lindis catchment. Indicative locations are shown in Figure 24 and Figure 25. A 5 year duration is sought for the permit to construct these bores.

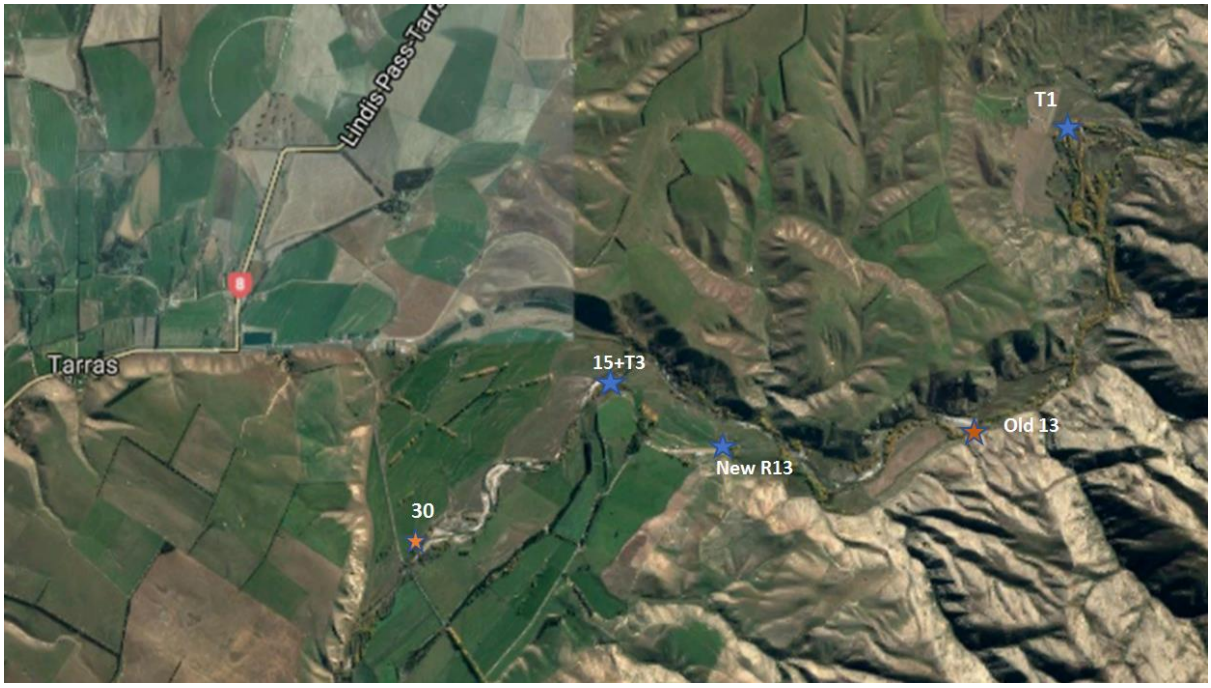

Figure 24: Site of Proposed bores/gallery intakes R13 and T3

Figure 25: Site of proposed bores/gallery intakes to replace Ardgour and Tarras Race Intakes

All bores will be constructed approximately to the following specifications (except for T5 which may be deeper):

- Bore diameters: 150mm - 400mm depending on the expected yield
- Estimated depth: 20 metres
- Estimated casing depth: 17 metres to allow for a 3 metre screen
- Casing material: Steel
- Method of drilling: Rotary
- Method of construction: Percussion

None of the bores will be constructed within 50 metres of known contaminated sites, septic tanks/outfalls or long drops. Nor are they located in a historical site, or a site known to be of cultural or spiritual significance to iwi.

Bores will be located more than 50 metres from property boundaries, unless investigations show that it is necessary to place a bore within this distance to ensure sufficient yields are available. Detailed site maps will be supplied once locations of bores have been finalised.

7.2 Purvis Family, Cluden Station

Water rights:

Tarras Race LIC water and Take point 31c, Consent 2003.251.V1, LIC owned Take point 31b consent 2006.254.V1

Water use

The Purvis family own and operate Cluden Station. Cluden Station is 10,000ha and has access to two sources of water for their irrigation. The Purvis' run sheep and cattle on a large dryland operation with an area of irrigated pasture for winter feed, and finishing stock.

Cluden Home Block

The first source is 22 l/s from the Cluden Swamp (Consent 2003.251.V1) which is a small unnamed tributary that doesn't connect to another waterbody. This water is used to irrigate 70 ha of this in k-line. LIC also have a consent to take augmented water at 14 l/s from the same site (Consent 2006.254.V1).

As explained in the AEE the reliability of the Cluden Swamp water is not known but we suspect the irrigation on land surrounding this swamp is contributing to the recharge of this swamp and so affecting water availability from this swamp. There is a complex off-take set-up from this swamp with three different race structures in the same area. A measuring system hasn't been installed because of the complexity of the off-take system and the Purvis' uncertainty about the permit being replaced.

The second source of water is 56L/sec from LIC's Tarras Race. This is currently used on the home block under border dykes. This race will eventually close leaving the Cluden Swamp water as the

only water source for the home block. Cluden Station also own land beside the Lindis River just downstream of the Cluden Confluence. Their LIC Tarras race water will be abstracted directly from the River at that site, locally known as Archie's Flat.

Outcome sought if 550 min flow

Cluden Station will replace their 22L/sec permit from the Cluden Swamp and seek to have the LIC Cluden Swamp permit of 14L/sec transferred to them. This combined water will be used to irrigate the 70ha of currently irrigated paddocks. L-Line style Longline sprinklers are in place and further conversion from border dyke to k-line will occur once the water is secured. These paddocks were previously irrigated with Tarras Race water as well. The command area for this water is shown in Figure 36.

The LIC Tarras Race water will be transferred to a new abstraction site on the Lindis River at Take Point T1 (Figure 24). This water will irrigate 70ha of land near the Lindis River, using 2 pivots and a fixed grid. The Purvis family plan to install the first pivot as soon as this water is shifted to this site, then the remaining pivot and the fixed grid would be established once the reliability of supply is better understood.

Table 19: Allocation sought for Cluden Home block

Take Point	Old consent	Hectares	Rate of take	Volume as per Aqualinc	Volume requested	Residual flow proposed	WEX
31b	2003.215.v1	70	36L/sec	567,000	567,000	none	WEX0183
31c	2006.254.v1						

7.3 Rutherford Family, The Point

Water rights

Take points 13 and 14, Consents 96066, 96967v2, and Ardgour LIC water

Water use

The Point is owned and operated by the Rutherford family. It has been in the Lethbridge/Rutherford family for over 5 generations. There are currently 3 generations on the farm, Alastair and Sue Rutherford and their son and daughter in law, Tim and Camilla and their child. Their daughter Sarah and her family are also involved in the family business.

This farm is 5465 ha in total with 460ha of irrigation. With further efficiency improvement the total irrigated area will increase to 505ha. The Point has 2 sources of water. The first is Take 13 from the Lindis River, where they can abstract up to 330 L/sec, while the second source is Take 14 from Waiwera Creek and allows them to take up to 56 l/s.

The Point is a sheep, beef and deer property. The irrigation water is used to grow pasture, and crop for animal feed. Like the other larger farms in the catchment, the irrigated paddocks are an integral balance to the mostly dryland farm.

The Rutherfords have ongoing plans for irrigation efficiency improvements through further conversion to spray application, however a number of the upgrades will only be completed after the water permit has been replaced. Currently they irrigate using 3 large pivots and 1 smaller one that moves across several hydrants on a flat area of the property near the Lindis River. They also have three hard hose guns and border dykes.

The water is currently taken by The Point via a race system that abstracts water at the northern end of the farm on the river boundary and uses gravity to reach the irrigated areas of the farm. A pumped system will be installed closer to the irrigated area of the farm, downstream of the original intake. This will be a more expensive system to run but will result water being left in the Lindis River for 2km longer.

Figure 26: The Point

Figure 27: Pivot irrigation on The Point

Figure 28: Stock on the The Point

Water use records

The water data is telemetered and displayed on Boraman Consultants website.
The Waiwera water is delivered via gravity pipes.

Figure 29: Waiwera Creek Intake

Table 20: Water metering data for The Point Take 13 and 14

Year	Lindis River (Take 13)		Waiwera (Take 14)	
	Rate L/sec	Volume m^3	Rate L/sec	Volume m^3
2013-2014	363	4,964,096	42	(not a full year of data)
2014-2015	307.2	5,209,557	38.1	238,386
2015-2016	440.3	5,562,227	35	238,142
2016-2017	352.5	4,861,031	36.7	184,483

Outcome sought at 550 min flow

The Rutherfords have plans to install a number of pivots once their permit is replaced. However the level of development and the security on the initial investment all hinges on the minimum flow being 550L/sec.

If the minimum flow is higher than 550 then no further upgrades would be feasible with such poor water reliability. The location of the Ardgour Race through The Point would also obstruct spray development.

Assuming a minimum flow of 550L/sec then the Rutherfords will shift Take 13 (Lindis River) to a gallery intake (Take Point R13) located in the Lindis Ribbon Aquifer further downstream as shown on Figure 24. The exact location of the new point of take will be known once drilling tests have been completed and assessed.

The rate of take from Take R13 from the Lindis River will decrease from 381L/sec to 295L/sec. The total annual volume sought for the two takes is 4,090,500m³. The take will shift from a surface water take to a gallery in the ribbon aquifer. The rate of take from Take 14 from Waiwera Creek will be 42L/sec.

The Rutherfords are considering the development of a storage dam to enable water harvesting at higher flows from Waiwera Creek. This means that they are also seeking 120L/sec of supplementary allocation water from Waiwera Creek, at the same point of take.

The change to the gallery intake for the Lindis water will result in a large increase in power costs. So they would like to investigate the option to harvest some water from Waiwera Creek at higher flow at an elevated site on the farm and the use gravity to deliver and apply it. The size of the dam that is possible at this site may limit this opportunity.

They request that hydro-generation also be included in the purpose on the permit, this would occur within the allocation limits being sought from Waiwera Creek.

Table 21: Allocation sought for The Point

Source	Purpose	Rate L/sec	Volume m³	Residual
Lindis Take R13	Irrigation, stockwater, storage, hydro, domestic	295	4,090,500	N/A
Waiwera Take 14		42		Visible surface flow
		120 (supplementary - 1600min flow)		N/a

7.4 Smith Family, Tarras Properties Ltd

Water permits

LIC Tarras Race and Take point 15: Consent 2001.544

Angela and James Smith and their young family of Tarras Properties Ltd have recently purchased their property from Pete Jolly, which was formerly farmed as part of Kotiti. This property has an existing water permit from the Lindis River marked as Take Point 15 (Consent 2001.544). The Smiths will continue to exercise this permit which will be transferred to their name during this application process. The irrigation water will continue to be used to grow pasture to graze sheep. The total property owned by the Smiths is 700ha with up to 300ha of irrigation.

Figure 30: Paddocks on Smith farm –situated at true right of the Lindis River and currently border dyked.

The consent to take water from the Lindis River (Consent 2001.544) expires in 2019, and the Smith's are seeking to replace this permit. This water is used on the flats beside the Lindis River at the Adrgour Bridge. There are 110ha of lazered border dykes and plans to spread the water over a further 20-30 hectares in the area. The remaining irrigable 160 ha lies on the plateau to the west of the Lindis River and on the rolling hills to the north of the River.

Water use records

The previous owners, the Jollys, had issues with their measuring data as the intake gets disturbed by freshes and floods in the Lindis River. The monitoring site has a data logger but no telemetry at this site due to lack of phone coverage. There are only 2 years of good data. In those years the total volume abstracted did not reach the consented amount or the efficient amount for those 110 ha (using a figure of 8,100/m^3/ha) which would be 810,000m^3.

Water use data

Table 22: Water meter data for Take 15

Year	Lindis River (Take 15)	
	Max Rate L/sec	Annual Volume m³
2015-2016	76.67	352,514
2016-2017	72.22	156,594

Outcome sought at 550 L/sec minimum flow

The Smiths will shift some of the LIC Tarras Race to Take 15 to top up the volume on this permit. The rate of take will decrease to 80L/sec but the volume will increase to 1,053,000m³, on the basis that the previous owners used LIC water on this block and other land of theirs all season.

A further 20L/sec and annual volume of 567,000m³ as primary allocation water (again this was LIC water used by previous owners) from Tarras Race will also be abstracted from the river directly along the boundary of the farm with the river. A site is yet to be determined. This water will be used to water the terraces or plateau above the river flats. The new intake site is called T3 and will be located at or near Take Point 15. The water abstracted from Take 15 and T3 will be sufficient to irrigated 200ha.

A new supplementary permit is sought to develop the remaining 100ha. A rate of 50 L/sec and an annual volume of 810,000m^3 is sought for this permit.

Table 23: Allocation sought for The Smiths

	Take point	Rate L/sec	Volume m³
Lindis River (primary)	15	80	1,053,000
	T3a	20	567,000
Lindis River (supplementary)	T3b	50	810,000

7.5 Jolly Family, Kotiti

Water permits

LIC Tarras Race and Take point 32: Consent 2001.546V1 and Clutha water.

Water use

Kotiti is owned and operated by 2 generations of the Jolly family - Peter and Debbie Jolly and daughter Lizzie with her 2 children. The Jollys have recently sold 700ha to the Smiths of Tarras Properties Ltd, leaving 450ha that they use to grow pasture for sheep and beef grazing and arable farming. The irrigation water is used to finish lambs, grow crops and winter feed for stock.

The Jollys have three sources of water: LIC Tarras Race water, water from a small Spring and Clutha water.

The Spring water (Take 32, Consent 2001.546) is being replaced through this application. This water is used in combination with Tarras Race water on 37ha near the homestead on Jolly Rd. The reliability of the spring is unknown and is summarised in the AEE. This permit allows for 26L/sec and 67,400,000L/month to be abstracted.

Once the race closes LIC Tarras water will not available for the home block opposite the Tarras township known as Koitit. Kotiti has 1 small storage pond, of approximately 12,000m^3 in size to act as a buffer pond for water management on the farm.

The Jollys also have access to water from the Clutha however it is very expensive to use this water, due to the operational costs associated with pumping. Accordingly the Jollys would prefer to minimise their reliance on this water. However if the minimum flow is set at 550 L/sec and the Tarras Race is closed there will be areas of their farm which will be irrigated solely by Clutha water.

This property currently supports 2 families plus 2 full time employees with partners, as well as one casual tractor driver. Even though the Jolly family have sold part of their land the remaining parcel is very productive and will see their employees remain stable.

Water use data

Table 24: Water metering data for Take 32 (Consent 2001.546)

Irrigation season	Max rate of take L/sec	Annual Volume m³
2013-2014	Over 26	149,115
2014-2015	Over 26	219,397
2015-2016	Over 26	179,071
2016-2017	0ver 26	149,799

Outcome sought at 550L/sec minimum flow

The Jollys will replace their permit to take water from the spring at Take point 32. Once the Tarras Race closes LIC water use on the farm will not be an option. This property will be fully reliant on Clutha water and the spring take. The area irrigated by the spring take is 37ha which requires about 299,700m³ per year. Records show less than this has been abstracted but given this Take is located outside of the Lindis catchment and is not subject to a primary allocation limit (and is therefore not subject to Policy 6.4.2A) we seek a volume for the full amount required for 37ha. This area is shown in Figure 36.

Table 25: Allocation sought for the Jollys

Take	Point	Rate L/sec	Volume m³	Location of use
Spring	32	26	299,700	PT LOT 6 DP 3510

7.6 Hayman Family, Pukemara

Water rights

Mackay branch of the Tarras Race, LIC

Water use

The Haymans use 20L/sec from the Tarras Race to irrigate pasture on the block near SH8. This race will be closing down. The Hayman's property also borders the Lindis River. The Haymans run a sheep and cattle farm. They have over 400ha on the top of the plateau behind the Tarras township that is suitable for irrigation. The whole farm is approximately 700ha. Stockwater is currently supplied to the plateau on Pukemara from a bore near the Lindis River.

Figure 31: Stockwater bore for Pukemara near Lindis River

Figure 32:Stockwater set up on Pukemara

Outcome sought at 550L/sec minimum flow

The Haymans propose to transfer the 20L/sec abstraction of their Tarras Race water to a bore located in the Lindis ribbon aquifer on the true right of the Lindis, Take Point T2. The exact location of the bore is yet to be determined but the site of a current stockwater bore may be suitable.

The water will be used to irrigate the plateau. This is the Haymans only source of water. The Haymans are also applying for supplementary water to fill storage at times of higher flow (flows >1600L/sec). They are still designing the storage and irrigation system but plan to pump the water up the terrace to be applied on the plateau with spray systems. There is a dam site that will hold an estimated 5Million m³. To irrigate 400ha a volume of 3,240,000m³ is required.

Total volume of the 20L/sec primary water would be 414,720m³, which would water 52ha.

The supplementary permit could abstract up to 200L/sec for a total volume of 2,825,280m³ which would be used to irrigate a further 350ha.

7.7 Lindis Crossing Station

Water rights

Tarras Race LIC

Water use

Lindis Crossing has two sources of water. Clutha water and an existing bore are not being replaced with this application.

This application only relates to the moving of the Tarras Race water to a bore for Lindis Crossing Station (and not the Clutha water). Lindis Crossing uses 56L/sec of Tarras Race water on their property. They pump their water to the top of the plateau and irrigate a combined area of over 430ha. On the southern faces and lower terrace Lindis Crossing Station consider there is the potential to bring in a further 170ha of irrigation resulting in a total 600ha of irrigation. Lindis Crossing Station is a finishing unit. They bring in deer, cattle and lambs and use the irrigated land to

increase the animal's weight and condition to an optimum consumer ready state. All irrigation is done using spray technology. They have pivots and k-line. They have ponds on the terrace where the water sources are combined and then feed out to the irrigation delivery pipes.

Lindis Crossing Station is currently replacing another water consent that permits 90L/sec and 880,000m³. We propose to shift the LIC volume to this existing point of take but not increase the current rate of take beyond 90L/sec. The current bore under RM14.164.01. T4 is marked on the map.

Outcome sought at 550 min flow

Lindis Crossing are seeking to abstract a greater volume from their current bore at T4, without changing the rate of abstraction. The extra volume water will be used to irrigate approximately 90ha of the total block. Therefore the rate of abstraction will be linked to (and will not exceed) a combined total of 90 L/sec with the existing permit (RM14.164.01) and an additional volume of 729,000m^3/year is sought under this replacement permit for T4.

Lindis Crossing are also seeking a new supplementary permit of 56L/sec at a similar location as the bore for RM14.164.01. So they may abstract some of their volume at a greater rate of take above 1600L/sec flow in the Lindis. The total volume does not change.

7.8 Beau and Anne Trevathan, Lindisvale

Water rights

LIC Ardgour Race water

Water use

Beau and Anne Trevathan own and operate Lindisvale. Lindisvale is a pastoral farm, producing beef venison and lamb, as well as dairy support and grazing.

Lindisvale is supplied from the LIC Ardgour Race, with an allocation of 86 l/s.

This water is used to irrigate up to 155 ha which is the whole farm. Irrigation is mostly carried out by border dyke with a small area of k-line (15ha). The Trevathans are not in a development phase, and it does not suit their business plan or lifestyle choices to start an expensive irrigation development programme on their farm. They enjoy the farming system that is currently practiced on their land. They have considered their options and have decided to continue their style of farming until the Ardgour race is closed and then set up their farm with the water rights in a way that would enable the continuation of their farm or provide some flexibility should they decided to sub-divide.

The Trevathans have 3 bores that they abstract groundwater from but these are used for domestic purposes only. The most recently drilled bore has been tested to deliver 30 l/s.

Outcome Sought at 550 min flow

The Trevathans request to shift their allocation of 86 l/sec to a gallery from the Lindis River across the road from the farm, Take Point A6. The intake would most likely be an infiltration well or gallery

taking groundwater connected to the Lindis River and will be a shared intake site with Bruce and Linda Jolly or Ardgour Station. This water is used to irrigate 155ha of the Trevathan's property and so they require 1,255,500m³.

7.9 Bruce and Linda Jolly, Ardgour Station

Water use

The Jolly family own and operate Ardgour Station which is a sheep and beef farm, including merino breeding. Ardgour Station is 3100ha in total. Recently some of the property was subdivided and sold to Tarras Farm Ltd. The take from Shepherds Creek has been transferred to Tarras Farm Ltd.

Ardgour Station is a shareholder in the LIC Ardgour Race. The water is used to irrigate pasture with pivots, k-line and wild flood. The Jolly's have been upgrading their water application methods for many years. The feed grown under irrigation is used to finish lambs and cattle, and produce winter feed. The area currently irrigated by Ardgour water is 137ha.

Water sourced from the Clutha River is also used on a separate area to irrigate a further 109ha.

Outcome Sought at 550L/sec minimum flow

Ardgour Station are seeking to shift 64L/sec of Ardgour Race allocation to an infiltration well located in the Dry Creek groundwater fan adjacent to the Lindis River. This site has been labelled Take Point A6 and will be used in conjunction with Trevathans.

If the combined bore with the Trevathans doesn't yield the rate required they will look at a separate bore in the Dry Creek Fan area. The water will be used to supply the existing pivots and spray systems to grow pasture for the sheep and beef operation. The Jollys are also investigating diversifying into cherries and grapes. They are looking to expand their irrigated area through efficiency improvements and supplementary water to reach a possible area of 280ha. The volume required for this area is 2,268,000m³. This will be sourced from a combination of primary and supplementary water.

The Jolly's primary rate of take will be 64L/sec with a total volume of 1,342,500m³. Further supplementary allocation of 925,500m³/year at a rate of 100L/sec is also requested.

As Ardgour Station does not have any river frontage an easement will be negotiated with the Trevathans.

Storage options are being investigated including a storage dam of 110,000m³, to retain sufficient reliability of supply once the minimum flow of 550 L/sec is implemented and to accommodate the supplementary water.

7.10 Cooke Family

Water rights

Take point 18: Consent 2001.995, LIC Ardgour and Tarras Race water

Water use

The Cooke's property is a family run beef and sheep finishing farm which is split across 3 parcels of land totalling 140ha. Two of their blocks are supplied with LIC water, one from the Ardgour race and the other from the Tarras race. The third block of land in the Ardgour Valley has its own bore water from Take 18 (Consent 2001.995).

The bore (Take 18) is used to irrigate 40 ha, via a lateral pivot. The bore is located some 500m away from the Lindis River. The Cooke's are currently consented to take 20 l/sec from this bore, and up to 414,720m^3 annually.

Continued access to water from this bore is vital to ensure that their investment in the pivot remains viable, and to gain maximum benefit from the pivot. The annual water take data from the bore has been lower than optimum for the paddock as the bore and infrastructure are not well designed and set-up.

Their second block in the Ardgour Valley is called the Shepherds Creek Block and is supplied with water from LIC's Ardgour Race, which runs across the top of this block. This water is used to irrigate 54ha by a combination of borderdyke, flood and k-line.

The Cooke's third block is known as Tomich Hill and is located on State Highway 8. This block is irrigated using a branch of the Tarras Race known as the Mackay race water.

Stock numbers: 200 to 400 Beef cattle and 1000 lambs.

Water use records

Table 26: Water records from Take 18 (Consent 2001.955)

Year	Max rate (L/sec)	Annual volume (m^3)
2012-2013	26.7	179,475
2013-2014	23	37,625
2014-2015	27	64,957
2015-2016	20	112,977
2016-2017	20	119,320

Outcome Sought at 550 L/sec minimum flow

Lateral Pivot Block with Take Point 18

The Cookes propose to replace their existing bore permit with an additional 5 L/sec from their LIC Tarras allocation. This will be used to irrigate 45ha. The rate of take sought for Take 18 is therefore 25 L/sec. The volume sought is 364,500m3.

The irrigation area on the Shepherds Creek Block of 54ha will be watered in the future from a bore that will abstract 35L/sec. This is the LIC Ardgour race water which will be abstracted from a location close to Take Point A7. The volume to be abstracted at A7 will be 437,400m³.

Tomich Hill

Due to the proposed closure of the Tarras Race, the Cookes would like to replace some of this lost Tarras Race water with a small groundwater take of 15 L/sec. They currently have a household bore to a depth of 28m, but need to carry out investigations to see if this bore site could work or whether they need to drill a second site. This block and the associated bore is located outside of the Lindis catchment.

The Cookes plan to subdivide up the Tomich Hill block and anticipate that a small amount of water to irrigate 15 ha of grapes, cherries or applies for this block. A land use consent to construct a bore on this property is included in this application. A permit to take groundwater from this bore will be applied for separately once the necessary groundwater assessments are carried out on this bore.

Table 27: Water allocation sought by Cookes

Source	Rate of take L/sec	Annual volume m³
Lindis Ribbon aquifer current bore (Take 18) – including portion of LIC Tarras Race water	25	364,500
Lindis Ribbon aquifer Take A7	35	437,400

7.11 Rive and Reed Family: Cloudy Peak Pastoral Ltd and Wainui Pastoral Ltd

In co-operation with business partners, Jayne Rive and George Reed own and manage two properties, Cloudy Peak and Wainui.

Cloudy Peak Pastoral Ltd

Water rights

Ardgour Race LIC water to A2, Transfer of a portion of Take 16: WR1753CR and WR778796CR to B2 as supplementary allocation, Consent 2007.497.v1 (No take number as not being replaced as part of this application)

Water use

Cloudy Peak is a merino sheep operation, with all lambs finished on the farm. Currently 88 ha are irrigated by pivots and k line. The water is used to grow winter feed and to finish the lambs. The total farm size is 2083 ha. The dryland areas have been undergoing extensive rehabilitation from weed and rabbit infestations.

The Rive family have only owned the farm for 5 years and is still working very hard to get the property performing optimally with good pastures, irrigation systems, paddock design and pest control. Since owning the farm they have converted much of the old flood irrigation into spray under a pivot and k-line.

Figure 33: Winter feed under irrigation

Figure 34: Topdressing fertiliser on dryland

If the 900 L/sec is set as the minimum flow then this small business will be very badly impacted as investments in efficient systems that require reliability have been made early for the good of water management and the environment. Those spray systems including a pivot will sit idle and the viability of the whole farm will be at risk.

Cloudy Peak is supplied with water from two sources:

- 23L/sec LIC Ardgour Race
- 28 L/sec from a gallery in the ribbon aquifer beside the Lindis River (2007.497.V1). This permit has until 2032 so will not be replaced in this group application.

Water taken under permit 2007.497.v1 is used to irrigate 40ha under a pivot. The Ardgour water currently irrigates a different area of 48ha which is proposed to increase to 75ha after the Beggs Stacpoole and Ardgour races close, as a portion of the water currently abstracted from Beggs Stacpoole will be shifted to Cloudy Peak. Proof of use of the Beggs Stacpoole water is described in Section 7.14. Cloudy Peak will utilise 15L/sec and 243,000m³ of Beggs Stacpoole water, but as supplementary allocation.

Two farming families are supported by Cloudy Peak. Jayne, George and their daughter Matilda and Jayne' parents. Jayne's parents also assist on the farm. All other work is done by contractors.

Outcome sought at 550 L/sec minimum flow

The Ardgour Race and Beggs Stackpoole water will be abstracted from a gallery on the hill side of Ardgour Rd. The bulk of the farm is on this side of the road and if a suitable site can be found it will mean water pipes do not have to be laid under the road. Take A2 is marked as the indicative site.

This water will be used to irrigate 75ha so will require a maximum volume of 607,500m³, with 364,500m^3 of this abstracted from Take A2 as primary allocation at a rate of 23 L/sec. New k-line will be installed for use of this water. A new pump and piping system will all have to be installed and upgraded.

The Beggs Stacpoole water will be issued as a new supplementary permit at Take point B2, which is at the same site as A2. The Beggs Stacpoole water will be at 15L/sec with a volume of 243,000m³.

Wainui Pastoral Ltd

Water rights

Ardgour Race LIC, Wainui Creek Consent 2004.230.V1 (No take number as not part of this application)

Water use

Wainui Pastoral Ltd is a bull beef, dairy support and lamb finishing operation and has a total area of 352 ha. The property has 277ha of dryland and 75 ha of irrigation.

Wainui has two water sources:

- 38 l/s from the LIC Ardgour Race – this is used to irrigate 68 ha on this property
- 4l/s from a bore (2004.230.V1). This permit isn't being replaced with the application.

The race water is applied using a pivot, k-line and gun. The irrigated pasture is used to graze stock through winter and grow bull beef to the size ready for the abattoir.

Two other bore consents are held in the name of Wainui Pastoral Ltd – both of these are inactive and can be cancelled if they haven't already.

This property is managed by Jayne and George in a business partnership with another couple.

Outcome sought at 550 min flow

The LIC Ardgour Race water will be abstracted from a gallery intake from around the area of Take point A9 once the race has been closed. Full development of pumps, pipes and the re-engineering of spray systems will be required. This will be a huge cost for this small farming business.

7.12 Small block owners on LIC Ardgour race: Glen Williams, Alistair Madill, Dry Creek Enterprises Ltd - Pauline and Michael Hyndman, McElraes plus others

Water rights

There are a number of small block owners on the LIC Ardgour Race that will be transferring their right to small galleries in the Lindis Ribbon aquifer.

Water use

Williams

Glenn Williams owns the block of land on the eastern corner of Ardgour Rd and Ruffle Rd. Historically this property has been used for grazing sheep, in the future goats are also likely to be grazed on the property and a fruit and nut tree orchard will be established.

This property is supplied with 4.3 L/s of LIC water from the Ardgour race and this is currently used to irrigate 8ha using spray irrigation including k-lines and sprinklers.

He is also supplied with water from Oak Tree Ltd and uses this for domestic purposes.

Madills

The Madills have a small holding on Ardgour Rd of 17.5 ha that is supplied with 6L/sec from LIC's Ardgour Race, as well as an existing bore which supplied water for domestic purposes only. Alistair Madill has a vineyard and pasture, but leases out most of his pasture land, which is used by the leasee for grazing stock. Up to 11 ha is irrigated on the block.

The water from the Ardgour Race is currently used to irrigate his vineyard and fill a pond of approximately 3000m³ in capacity – this water is used for frost fighting. Water is currently applied using border dykes and drippers.

Dry Creek Enterprises

Dry Creek Enterprises own a small block of land that is primarily leased out for grazing. This property has an allocation of 8L/sec from LIC which is irrigated using contour flood systems.

The Dry Creek Enterprises have an existing bore for domestic purposes.

McElraes

The McElraes have Ardgour Race water that is used to grow pasture on 8ha of their block. They graze sheep and cattle. There is already a domestic bore on the property.

Other small block owners

There are several small block owners who are yet to confirm their future water use plans. They have small entitlements to Ardgour Race water which is used to grow pasture, gardens and house hold orchards. The water is generally flood irrigated. There is approximately 10L/sec used by this group.

Outcome Sought at 550L/sec minimum flow

Any changes by the owners of smaller blocks will require completely new application systems for their water. The water abstraction changes are as listed below:

- Williams will shift 4.3L/sec and 64,800m³/year to an area near Take A1. This site may be shared with some of the other small block owners.
- Madills are seeking to transfer his allocation of 6 L/sec and 89,000m³/year from the Ardgour Race to their existing domestic bore, Take A5.
- Dry Creek Enterprises propose to transfer their 8L/sec and 97,200 m³/year from LIC to their existing bore in the Dry Creek alluvial fan, Take A8 once the Ardgour race closes.
- McElraes propose to transfer their water of 4.3L/sec and 64,800m³ to somewhere close to Take A3.
- Other small block owners will confirm their transfers to new sites either in combination with those above or at separate sites along this lower stretch of the river recorded as A4. The total rate of abstraction will not be greater than 10L/sec and 331,776m³
- The total volume abstracted by this group will be 647,576m^3

The changes required to move to the gallery systems will be very expensive for the small block owners, as many do not make much money from the use of their water. They will need time to plan and budget for the upgrades and new systems.

7.13 Tarras Farm Ltd

Water rights

Take point 17 Consent 2000.690 Shepherds Creek (No LIC water)

Water use

Tarras Farm Ltd is a bull beef grazing operation. The irrigation is used to produce stock feed. Tarras Farm Ltd are the major owner of a water permit from Shepherds Creek. The water from this take is conveyed by pipeline to a 150,000m³ dam. The total area irrigated on this farm is 291ha. There is also Clutha water used on this farm, but pumping of this water to the irrigated area is very expensive. Flows in Shepherds Creek are often very low in summer. Being able to gravity feed water into the storage (mostly during winter) assists to make the irrigation on the farm affordable. The dam ensures the variable flow in the Shepherds Creek can be utilised more effectively. This permit is used 12 months of the year.

The other portions of this water are owned Perriams and Shepherds Creek Ltd and they have agreed to transfer their portion to Tarras Farm Ltd. All the water abstracted under this permit is measured through one monitoring device.

Shepherds Creek is a naturally ephemeral waterway, with no real creek bed at times, as noted in Appendix D.

The water is applied with spray irrigation systems including pivots, fixed grid, and k-line.

Water use data

Table 28: Water records for abstraction from Shepherds Creek

Year	Max Rate L/sec	Annual Volume m³
2013 – 2014	79	257,122.8
2014 – 2015	90	184,323.6
2015 – 2016	28.33	58,259
2016 – 2017	21.99	171,450

Outcome sought

We request this permit be replaced as a primary water permit. The assessment contained in Appendix D concludes that the creek is not connected to the Lindis River at all so being linked to the minimum flow is appropriate.

The replacement permit is sought with a rate of take of 28L/sec and a volume of 260,000m³ as demonstrated by their history of use. The water take is measured and the data telemetered to a service provider.

7.14 Beggs Stacpoole

Water rights

Take point 16: Consents WR1753CR + WR778796CR

Water use

This water permit is the oldest in the valley. It was granted in the late 1880s and has been used to grow pasture in the lower area of the catchment and on land that is to the south of the catchment which is now considered out of the catchment with an alternate source of water, the Bendigo Aquifer. The intake structure includes a dam in the Lindis River and an open race. The water user records show the history of abstraction. The water has been used to grow pasture for animal feed.

Water use records

Table 29: Data record for WR1753CR + WR778796CR

Year	Max rate L/sec	Annual Volume m^3
Year 2013 – 2014	257.49 Steady Flow: 96 L/sec	2,508,420.11 **Note.** Six negative daily volume figures removed.
Year 2014 – 2015	257. 49 Steady flow: 45 L/sec	139,2297
2016 - 2017	257.49 **Note.** Measuring station not operating for some months.	291,347.6 Dates inclusive: (21/12/16 - 13/03/17)

Outcome sought at 550L/sec minimum flow

A portion of the water right will be used by the Lindis Crossing Vineyards to irrigate grapes in the Lindis Catchment. A pasture block in the Ardgour Valley was planned to be a vineyard many years ago but they have been unable to access water. This 18ha of land lies above the Beggs Stacpoole race. The race and the intake structure will be dismantled and a bore into the Ribbon aquifer will be used to access their water directly to the property. Initially grass will be grown but grapes may eventually be planted. This will be approximately at Take point B1. The rate of take will be 10L/sec and maximum volume 145,800m^3. The surface take for the Beggs Stacpoole race marked as Take point 16 will close.

As described in the Cloudy Peak summary 15L/sec of the Beggs Stacpoole water will also be used by Cloudy Peak in the future a supplementary.

Table 30: Allocation requested to replace Beggs Stacpoole water rights

Users	Take point	Rate L/sec	Volume m^3
Old Beggs Stacpoole	16	Steady flow 45 up to 250	291,300 +
New			
Cloudy Peak	B2 supplementary	15	243,000
Lindis Crossing Vineyard	B1	10	145,800

7.15 Robert Gibson, Malvern Downs

Water take

Tarras LIC water that will be lost at 550

Water use

Robert Gibson of Malvern Downs currently uses both Tarras Race LIC water and he has a right from the Clutha River. He uses the irrigation water to grow pasture and winter feed. Malvern Downs bring in young dairy cattle that stay on the property until they are ready to return to the dairy herd and be milked. They also have sheep. Malvern Downs is 143 ha and currently have 70ha of irrigation.

Much of the water is applied through border dykes. However this will be upgraded to spray systems as finances allow. The Clutha water infrastructure to deliver the water from the River has been built however Malvern Downs is still using its Tarras Race water on the land that Clutha water can irrigate. That is because gravity delivered water is much cheaper to get to the farm.

If the minimum flow is set at 550 L/sec Malvern Downs will lose their Tarras Race water supply and the Clutha water will then be used. However there will still be land that doesn't have a Clutha water supply.

Outcome sought

Malvern Downs wish to apply for a new water permit from two sources locally known as Church Creek/Main Race, but referred to as the Unnamed Spring in this application (Take 21) and Tarras Creek (Take 22). As explained in Section 10 it is not certain how reliable this water will be however if it does continue to be available during the winter and shoulder seasons then Malvern Downs would like to abstract and store it and use it to irrigate pasture.

The water sources do not connect to the Lindis River.

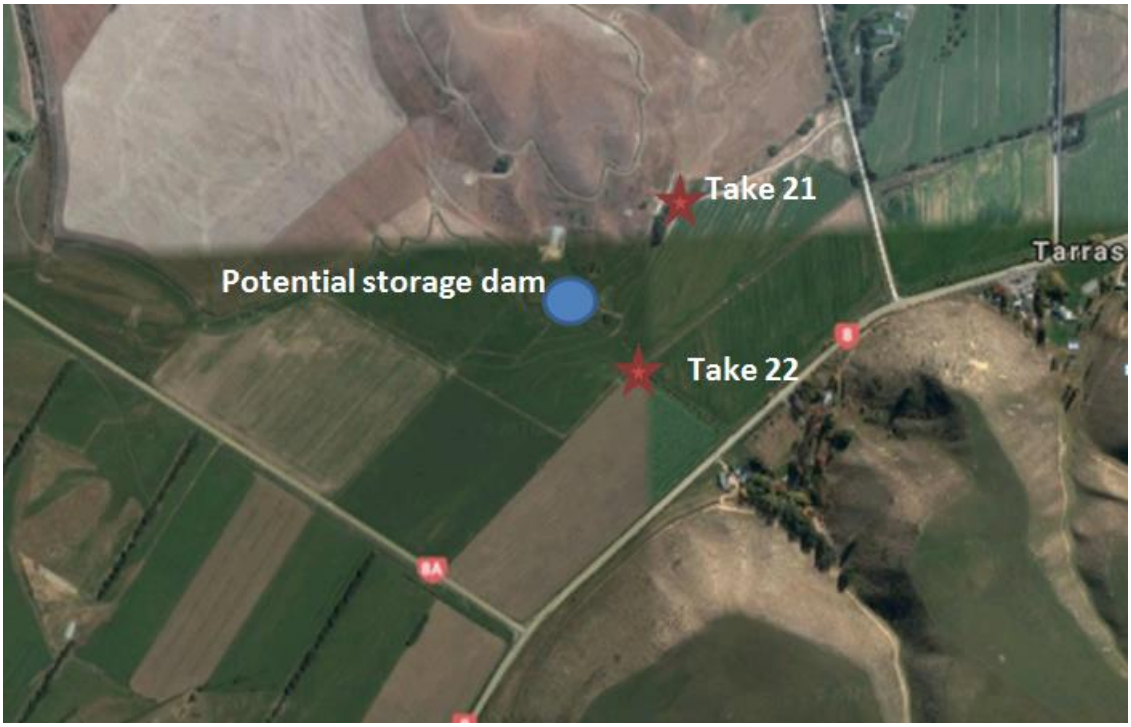

Figure 35: Proposed sites of Takes 21 and 22 and potential dam site on Malvern Downs

Table 31: Details of Permits Sought for Malvern Downs Proposed Take 21 and 22

Owner	Points of take	Rate of Take (l/s)	Annual Volume (m^3)	Legal description of take point	Map reference of take point	Location of water use
Malvern Downs	21	20	A combined total of 567,000	Lot 2 DP 396149	1315781 5029008	LOT 2 DP 396149
	22	20			1315781 5028244	

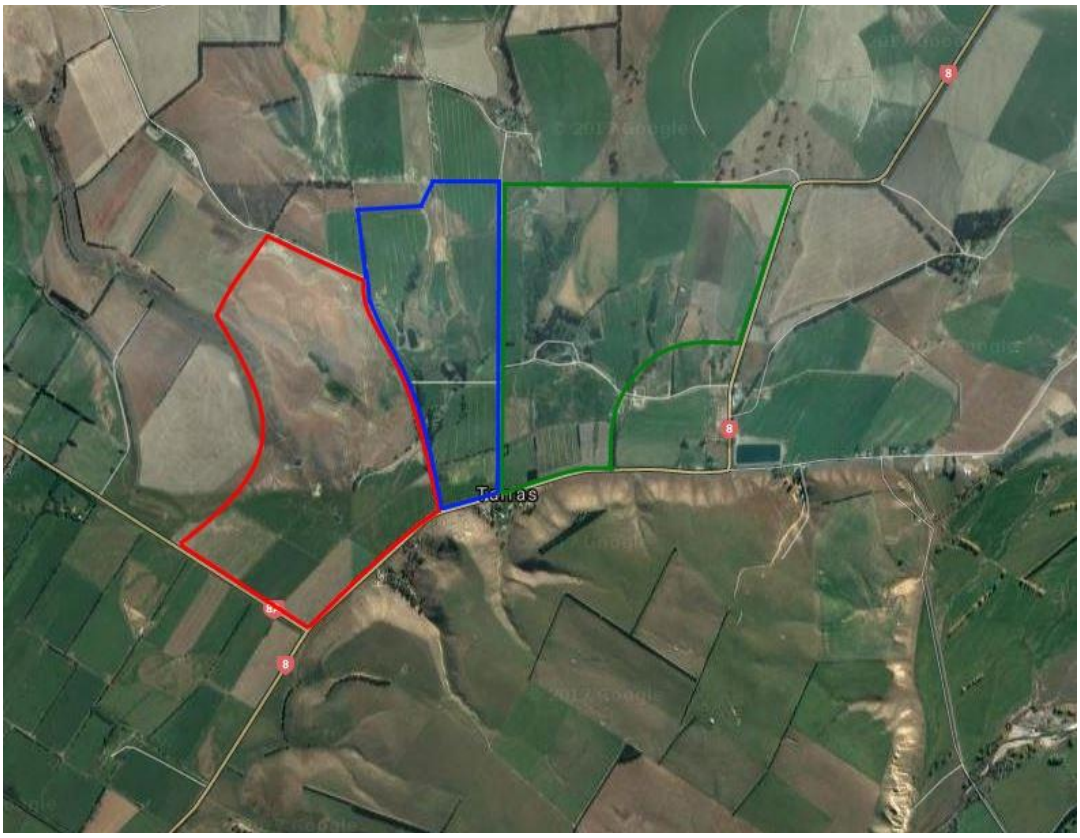

Figure 36: Proposed command area for water taken and used outside of Lindis catchment (Red: Malvern Downs, Blue: Kotiti – P. Jolly; Green – Cluden Station)

8. Legislative Analysis

8.1 Resource Management Act

Under Section 14 of the Resource Management Act (RMA) the taking and use of surface water can be authorised by a rule in a regional plan or by a resource consent.

Section 104 sets out those matters the consent authority must have regard to when considering a resource consent application.

> *104 Consideration of applications:*
> *(1) When considering an application for a resource consent and any submissions received, the consent authority must, subject to Part 2, have regard to–*
> *a) any actual and potential effects on the environment of allowing the activity; and*
> *b) any relevant provisions of—*
> *i. a national environmental standard:*
> *ii. other regulations:*
> *iii. a national policy statement:*
> *iv. a New Zealand coastal policy statement:*
> *v. a regional policy statement or proposed regional policy statement:*
> *vi. a plan or proposed plan; and*
> *c) any other matter the consent authority considers relevant and reasonably necessary to determine the application.*
> *…*
> *(2A) When considering an application affected by section 124 or 165ZH(1)(c), the consent authority must have regard to the value of the investment of the existing consent holder.*

With regard to s104(1)(b)(i) there are no national environmental standards relevant to this application.

In terms of any other regulations under s104 (1)(b)(ii) the Resource Management (Measurement and Reporting of Water Takes) Regulations 2010 are considered to be directly relevant to this application. The regulations impose minimum requirements on the holders of certain water permits to keep and provide records of fresh water taken under the permits. All permits will be required to be compliant with these regulations, and conditions of consent are included to this end.

Under s104(1)(b)(iii) there are two national policy statements directly relevant to this application: the National Policy Statement on Freshwater Management (2014); and the National Policy Statement for Renewable Electricity Generation. There are no relevant provisions within the New Zealand Coastal Policy Statement that relate to this application.

With regard to s104(1)(b)(v) and (vi), the ORC Regional Policy Statement (RPS) and Proposed Regional Policy Statement (PRPS) are both relevant to this application, as is its Regional Plan: Water for Otago (RPW).

The relevant provisions of these documents are considered in the following sections

In terms of s104(2A), this application is affected by section 124, as it involves the replacement of existing consents within the ambit set out by section 124(1). This means that the value of the investment of the existing consent holders is a matter to which regard must be had in considering this application. This is addressed in Section 10.12.

Section 136(2) of the RMA states:

> *"A holder of a water permit granted other than for damming or diverting water may transfer the whole or any part of the holder's interest in the permit—*
> *(a) to any owner or occupier of the site in respect of which the permit is granted; or*
> *(b) to another person on another site, or to another site, if both sites are in the same catchment (either upstream or downstream), aquifer, or geothermal field, and the transfer—*
> *(i) is expressly allowed by a regional plan; or*
> *(ii) has been approved by the consent authority that granted the permit on an application under subsection (4)."*

This section of the RMA is relevant to this application, as the applicant seeks to transfer the location of a number of points of take, and in a number of cases, to transfer a holder's interest in a permit to another permit holder.

Under section 136(4), regard must be had to the effects of the proposed transfer, including the effect of ceasing or changing the exercise of the permit under its current conditions, and the effects of allowing the transfer. These effects are addressed in Section 10.15 and 10.16.

8.2 National Policy Statement on Freshwater Management (2014)

A key planning instrument under the RMA is the National Policy Statement on Freshwater Management (NPSFM). The NPSFM aims to recognise the national significance of fresh water by promoting the sustainable use of water, through the setting of environmental limits based on a more nationally consistent approach that is scientifically robust.

While it is primarily relevant to the setting of objectives by the Otago Regional Council for the management of freshwater, it still informs the approach to be taken at a consent level in applying the relevant provisions of the ORC's planning documents.

Objectives of the NPSFM include:

> *Objective B1: To safeguard the life-supporting capacity, ecosystem processes and indigenous species including their associated ecosystems of fresh water, in sustainably managing the taking, using, damming, or diverting of fresh water.*
>
> *Objective B2: To avoid any further over-allocation of fresh water and phase out existing over-allocation.*
>
> *Objective B3: To improve and maximise the efficient allocation and efficient use of water.*

As noted in Section 10.3 and 10.4, this proposal will provide for the life-supporting capacity, and ecosystem processes, through the implementation of residual and minimum flows and the disestablishment of the large race intakes. Populations of indigenous species are primarily affected by factors outside of the control of the applicants, such as predation by introduced species and the impact of dams on the Clutha River, but the applicants are committed to supporting measures to protect these species.

This application represents a significant reduction in the total primary allocation within the catchment, both in terms of instantaneous rates of abstraction and annual volume, as shown in Table 32 below.

Table 32: Overview of consented, existing, and proposed allocation Limits

Allocation Existing and Proposed	
Instantaneous Rate of Abstraction	L/sec
Existing consented total consented instantaneous rate of abstraction	4005
Existing total recorded maximum instantaneous rate of abstraction (based on monitoring data) of primary allocation water taken from within the Lindis catchment	3,258
Proposed total maximum instantaneous rate of abstraction of primary allocation water taken and used within the Lindis catchment (under 550 L/sec min flow)	1,688
Proposed total maximum instantaneous rate of abstraction of primary allocation water taken and used within the Lindis catchment (under 900 L/sec min flow)	3,258
Annual Volume	m^3
Existing total consented annual volume for all primary allocation permits being replaced in this application	95,846,500
Existing total recorded annual volume for primary allocation permits being replaced by this application (based on maximum recorded annual volumes)	42,896,509
Proposed annual volume (under 550 L/sec min flow) of primary allocation water taken and used within the Lindis catchment	18,969,508
Proposed annual volume (under 900 L/sec min flow) of primary allocation water taken within the Lindis catchment and used both within and outside of the Lindis catchment	33,039,187
LIC Annual Allocation Only	m^3
Existing total recorded annual volume for LIC primary allocation permits only	26,445,544
Proposed annual volume (under 550 L/sec min flow) of LIC primary allocation only water taken and used within the Lindis catchment	6,180,321
Proposed annual volume (under 900 L/sec min flow) of primary allocation water taken within the Lindis catchment and used both within and outside of the Lindis catchment	20,250,000

Overall this application is considered to be consistent with the objectives of the NPSFM 2014.

8.3 National Policy Statement for Renewable Energy Generation 2011 (NPSREG)

The NPSREG sets out an objective and policies to enable the sustainable management of renewable electricity generation. The preamble to this policy statement states that it does not apply to the allocation and prioritisation of freshwater as these are matters for regional councils to address in a catchment or regional context and may be subject to the development of national guidance in the future. While this application does relate to the allocation of freshwater, the policies of the NPSREG do provide guidance on the inclusion of hydro-electricity generation within the purpose of a number of the water permits being sought – this does affect the allocation being requested, but simply extends the purpose of the use of the water.

Policy A requires decision makers to recognise and provide for the national significance of renewable electricity generation activities, including a range of benefits that result from these activities.

Policy E2 requires regional policy statements and regional and district plans to include provisions to provide for the development, operation, maintenance, and upgrading of new and existing hydro-electricity generation activities. The proposed Regional Policy Statement includes Policy 4.4.2 which promotes small scale renewable energy generation.

These policies support the establishment of small scale hydro-generation as sought in this application. This application is considered to be consistent with the NPSREG.

8.4 Otago Regional Council Regional Policy Statement and Proposed Regional Policy Statement

Both the RPS and the Proposed RPS include objectives which focus on enabling sustainable and efficient use while also maintaining, enhancing and protecting values associated with waterways, including iwi values, and include policies to achieve these.

8.4.1 Regional Policy Statement and Proposed Regional Policy Statement

The Proposed Regional Policy Statement (PRPS) was notified on 23 May 2015. The Council released its decision on Saturday 1 October 2016, and all of the provisions listed below are subject to appeal.

The provisions of both the operative and proposed Regional Policy require consideration and management of a range of often competing values, including economic, social, cultural, recreational, indigenous biodiversity and habitat for trout and salmon.

With respect to this application, the provisions of the RPS and the PRPS are generally consistent, although the PRSP provides a more detailed breakdown of the values to be considered, and often requires that a range of values are *all* maintained and enhanced. Given the general consistency between the two documents, issues of weighting are not considered to be critical.

In terms of productive use, economic and social well-being, the application seeks to implement the provisions of the RPS and PRPS by:

- meeting the needs of the applicants as primary producers (RPS Objective 6.4.1, Policy 6.5.2, PRPS Policy 1.1.2):
- providing for economic and social well-being of the applicants and their community (PRPS Policy 1.1.3):
- Significantly improving the efficiency of use of water, by:
    - Dis-establishing races
    - Conveying water for shorter distances and using pipelines
    - Increasing the proportion of efficient irrigation application methods
    - Significantly reducing the over-allocation of water in this catchment (RPS Policy 6.5.3, PRPS Policy 3.1.3):
- Enabling existing efficient irrigation infrastructure to continue to be used effectively (Policy 3.1.1), whilst also proposing the development of further efficient irrigation infrastructure within the catchment (PRPS Policy 3.1.3):
- Proposes a collective approach to water management in the catchment, including rationing during low flows (PRPS Policy 3.1.4)
- Promote small scale renewable electricity generation (PRPS Policy 4.4.2)

From an ecological, cultural and natural character perspective the implementation of a minimum flow of 550 l/s and the replacement of the large race intakes with several smaller gallery intakes, combined with the imposition of residual flows where appropriate in tributaries will significantly reduce the duration and extent of lower flows in the catchment, which will:

- Safeguard the life-supporting capacity of the Lindis River and its tributaries (RPS Objective 6.4.3):
- Enhance:
    - ecological and intrinsic values of waterways within this catchment (RPS Objective 6.4.4):
    - ecosystem health, indigenous biological diversity (PRSP Policy 3.1.9):, the range and extent of habitats provided by fresh water, the natural functioning of waterbodies and riparian margins (PRSP 3.1.1):
    - habitats of indigenous species and the habitat of trout and salmon that are important for recreational, commercial, cultural or customary purposes (PRPS Policy 3.1.9):
- Provide for the relationship that Kai Tahu have with the Lindis River (Policy 6.5.1).
- Enhance the cultural values associated with the waterways within the Lindis catchment (RPS Objective 6.4.4), provide for cultural wellbeing, (PRPS Policy 1.1.3) support Kai Tahu well-being (PRPS Policy 2.2.1) and recognising and protecting important sites and values of cultural significance to Kāi Tahu (PRPS Policy 2.2.2)
- Protect the natural character of the waterways within this catchment (RPS Objective 6.4.8), and will enhance the natural character and amenity values associated with the Lindis River; (PRPS Policy 3.1.2)

8.5 Otago Regional Council: Regional Plan: Water for Otago

The Otago Regional Council's Regional Plan: Water for Otago (RPW) contains objectives, policies and rules addressing the taking and use of water in Otago, including rules which require a resource consent for the taking and use of water in certain circumstances.

RPW objectives, policies and rules relating to water use and management form a framework that aims to recognise existing use of water, reduce over-allocation, increase efficiency of use and safeguard the life-supporting capacity and natural character of Otago's water resources.

8.5.1 Status of Activities

An overview of the activities associated with the replacement of each permit, and the status of the activity to take and use surface water is provided in Table 33 below.

Table 33: Status of activities to take and use water:

Take Point	Consent number	Location of Point of Take	In Lindis Catch-ment?	Allocation Status	Rule and Activity Status	Transfer of Location ?	Transfer of Holder?	Construct a bore
1	96196	Station Creek	Yes	Suppl*	Rule 12.1.4.3 RD	No	No	No
2	99298	McKenzies Creek.	Yes	Suppl	Rule 12.1.4.3 RD	No	No	No
3	96638. V2	An unnamed tributary of Long Spur Creek, known locally as Rocky Creek	Yes	Primary	Rule 12.1.5.1 Discretionary	No	No	No
4	96637. V2	Long Spur Creek	Yes	Primary	Rule 12.1.5.1 Discretionary	No	No	No
5a	99062. V1	Lindis River	Yes	Primary	Rule 12.1.5.1 Discretionary	No	No	No
b	99328.	Lindis River	Yes	Suppl	Rule 12.1.4.3 RD	No	No	No

Take Point	Consent number	Location of Point of Take	In Lindis Catch-ment?	Allocation Status	Rule and Activity Status	Transfer of Location ?	Transfer of Holder?	Construct a bore
	V1							
c	2008.361. V1	Lindis River	Yes	Primary	Rule 12.1.5.1 Discretionary	No	No	No
d	99022. V1	Lindis River	Yes	Primary	Rule 12.1.5.1 Discretionary	No	No	No
e	99329. V1	Lindis River	Yes	Primary	Rule 12.1.5.1 Discretionary	No	No	No
6	97059. V2	Tim Burn	Yes	Primary	Rule 12.1.5.1 Discretionary	Yes	No	No
7a,b	99021. V1	Cluden Creek	Yes	Primary	Rule 12.1.5.1 Discretionary	No	No	No
7a,b	96007. V1	Cluden Creek and Coal Creek	Yes	Primary	Rule 12.1.5.1 Discretionary	No	No	No
11	2001.807 V2	Lindis River	Yes	Primary	Rule 12.1.5.1 Discretionary	Yes	No	Yes
12	2001.809. V1	Lindis River	Yes	Primary	Rule 12.1.5.1 Discretionary	Yes	No	Yes
13	96066	Lindis River	Yes	Primary	Rule 12.1.5.1 Discretionary	Yes	No	Yes
14a	96967. V2	Waiwera Creek at two points	Yes	Primary	Rule 12.1.5.1 Discretionary	No	No	No
14b			Yes	Suppl	Rule 12.1.4.3 Restricted Discretionary	No	No	No
30	2003.186.	Bore, 50 metres west	Yes	Primary	Rule 12.1.5.1	No	No	No

Take Point	Consent number	Location of Point of Take	In Lindis Catch-ment?	Allocation Status	Rule and Activity Status	Transfer of Location ?	Transfer of Holder?	Construct a bore
	V1	of the Ardgour Road bridge across the Lindis River.			Discretionary			
15	2001.544. V1	Lindis River	Yes	Primary	Rule 12.1.5.1 Discretionary	No	Yes	No
32	2001.546	Springs east of Jolly Rd Tarras	No	Primary	Rule 12.1.4.5 Restricted Discretionary	No	No	No
16	WR1753CR + WR778796CR	Lindis River	Yes	Primary	Rule 12.1.5.1 Discretionary	Yes	Yes	Yes
17	2000.690	Shepherds creek	Yes	Primary	Rule 12.1.5.1 Discretionary	No	Yes	No
21	Proposed	Unnamed Spring	No	Primary	Rule 12.1.4.6 Restricted Discretionary	No	No	No
22	Proposed	Tarras Creek	No	Primary	Rule 12.1.4.6 Restricted Discretionary	No	No	No
31a	2003.110	Cluden swamp	No	Primary	Rule 12.1.4.6 Restricted Discretionary	No	No	No
31b	2006.254. V1	Cluden swamp	No	Primary	Rule 12.1.4.5 Restricted Discretionary	No	No	No
31c	2003.251.	Cluden	No	Primary	Rule 12.1.4.5	No	No	No

Take Point	Consent number	Location of Point of Take	In Lindis Catch-ment?	Allocation Status	Rule and Activity Status	Transfer of Location ?	Transfer of Holder?	Construct a bore
	V1	swamp			Restricted Discretionary			

*Suppl=supplementary

8.5.1.1 Activity: taking and use of surface water

Primary allocation takes within the Lindis catchment

The majority of the permits being replaced by this application are either deemed permits and/or were originally granted or applied for prior to 28 February 1998 and are located within the Lindis Catchment.

This application is made within the context of Proposed Plan Change 5A to the RPW. This plan change results in the inclusion of the Lindis Catchment within Schedule 2A and the introduction of a minimum flow of 900 l/s for the Lindis River to be a measured at the ORC's Ardgour Road flow monitoring site.

This minimum flow (and the primary allocation limit of 1,200l/s) is currently under appeal to the Environment Court by the applicant (Lindis Catchment Group) and the Otago Regional Council. These parties are seeking a minimum flow of 550 litres per second at the Ardgour Road flow monitoring site. However, under Section 86B(3) of the RMA the rules in Proposed Plan Change 5A have legal effect.

Accordingly the replacement of the majority of permits falls within Rule 12.1.4.4 as amended by Plan Change 5A, and these have primary allocation status and would assessed as restricted discretionary activities.

This application is made on the basis of an alternative minimum flow of 550 L/sec. This means that this application to replace these permits does not comply with Rule 12.1.4.4 (iii) and (v).

This application also seeks a delayed implementation of the minimum flow for all primary allocation takes within the Lindis catchment (with no minimum flow for Take 17). This is necessary to enable the changes to infrastructure proposed in this application. Accordingly all of these permits are sought on the basis of implementing a minimum flow of 550 L/sec *5 years* from the date the replacement permits are granted. This delayed implementation of the minimum flow means the application to replace these permits does not comply with the review approach contained in Rule 12.1.4.4(iv) and (v), as Policy 6.4.5 of the RPW makes it clear that this is to occur (at the latest) on the expiry of deemed permits on 2 October 2021.

Accordingly the replacement of all primary allocation permits within the Lindis catchment (except for Take 17 which is addressed below) are **discretionary activities** under Rule 12.1.5.1.

Supplementary allocation takes

Takes 1, 2, 5b, 14b and T2b are takes within **supplementary allocation** specified in Schedule 2B of the RPW (as amended by Plan Change 5A). Accordingly, these takes come within Rule 12.1.4.3 (also as amended by Plan Change 5A), and these takes are also **restricted discretionary activities.**

Primary allocation take not tied to the minimum flow

Take 17 (Shepherds Creek) is the replacement of a deemed permit and has **primary allocation status** under Rule 12.1.4.4. However, as this application seeks a lower minimum flow than set out in Schedule 2A for the Lindis catchment, the taking and use of surface water from this take point is a **discretionary activity** under Rule 12.1.5.1. This is anticipated by Policy 6.4.6, which provides guidance on how to assess such an application.

Primary allocation takes outside of the Lindis catchment

Takes 31b, 31c, 32 are from outside the Lindis catchment as shown on Map B4 of Plan Change 5A. These takes come within the ambit of Rule 12.1.4.5 as the related consents were granted or applied for prior to 28 February 1998. They have **primary allocation status** and are **restricted discretionary activities.** Under this rule these takes are not currently subject to a minimum flow.

Proposed Take 21 (unnamed spring) and proposed Take 22 (Tarras creek) are from outside the Lindis catchment and are **new primary allocation** takes in a catchment not listed in Schedule 2A. These takes come within the ambit of Rule 12.1.4.6 and are **restricted discretionary activities**. Under this rule a minimum flow will be set on a case by case basis. Based on the disconnected nature of these waterways from any other waterway (as assessed in Appendix D) a minimum flow for these takes is not considered appropriate.

8.5.1.2 Activity: Taking and Use of Groundwater

The taking of groundwater from the proposed infiltration galleries are all within the boundary of a Schedule 2C aquifer (the Lindis Alluvial Ribbon Aquifer).

Under Rule 12.2.3.1A the taking and use of water from these bores/galleries would be considered under rules (12.1.4.1 to 12.1.4.7) relating to the taking and use of surface water, as they involve the taking of groundwater from a Schedule 2C aquifer. However, as the standards and terms of these rules are not met, due to the request for delayed implementation of the minimum flow, the application to take and use water from these galleries is considered to be a **discretionary activity** under either Rule 12.1.5.1 (as groundwater takes connected to surface water) Rule 12.2.4.1 (as a groundwater take).

This application does not include an application to abstract water from Take T5 – this will be applied for separately once pump testing provides sufficient information to support such an application. However, a land use consent to construct a bore at this site is sought as part of this application.

8.5.1.3 Activity: Transfer of Location of Point of Take and Transfer of Interest to a New Permit Holder

The transfer of the location of Takes 6, 11, 12, 13, 16 and the transfer to a new permit holder associated with Takes 15, 16, 17, 31b have no activity status specified in the RMA or the RPW. As these permits relate to an activity for which consent is required under Part 3 of the RMA, section 87B(1)(a) is considered to apply to the transfer of an interest in the relevant permits, and these activities are considered as a discretionary activity. Regard must be had to certain effects under s136(4), as well as the matters in Policy 6.4.17. The effects of shifting the location of these Takes are a key part of the catchment management approach taken in the application, and have consequential flow on effects for water management throughout this catchment.

8.5.1.4 Activity: Construction of Bore

This application also includes the establishment of a number of bores (including infiltration galleries), as detailed in Table 34. As shown in the table, a number of the groundwater takes may be from existing bores or from new bores. For these Takes consent to construct a bore is sought to enable appropriate investigations of the most suitable site for the bore. Consent to construct a bore is not required for Take A5 and A8, as the taking of groundwater will be from an existing bore.

Table 34: Construction of new bores or use of existing bores

Take point	Shareholder	Construct a new bore or use existing Bore?
Tarras Race	Lindis Irrigation Co	
T1	Cluden Station-Purvis	New bore or surface water take
T2 area	Pukemara - Hayman	New bore or existing bore - investigate existing stock-water bore
T4	Lindis Crossing	Existing bore
T4b	Lindis Crossing	New bore
T5	Cookes – Tomich Hill	New bore or existing bore - investigate existing household bore
Ardgour Race		
A1	Williams	New bore
A2 & B2 (ex-Beggs Stackpoole)	Cloudy Peak-Rive	New bore

A3	McElrae	New bore or existing domestic bore
A4	Small block owners	New bores or existing domestic bores
A5	Madill	Existing bore – investigate & confirm increase in yield and volume
A6	B Jolly Trevathan	New bore
A7	Cookes	New bore
A8	Dry Creek Enterprises	Existing bore – investigate increase in yield and volume
A9	Wainui Station-Rive	New bore
Rutherfords Race	Rutherfords, The Point	
R13	Rutherfords, The Point	New bore
Beggs Stackpoole Race		
B1	Lindis Crossing Vineyard	New bore
B2	Cloudy Peak	Combined with new bore A2 – see above

Note that T3 (Kotiti - P.Jolly) is not included as this will be a surface water take.

The drilling associated with the construction of the bores is a **controlled activity** under Rule 14.1.1.1, with the exercise of control limited to:

a) The location of the bore including its relationship to other bores and other activities; and
b) The planned depth of the bore; and
c) The management of the bore head and maintenance of the bore; and
d) The nature of the bore; and
e) The method of drilling or excavation; and
f) The duration of the resource consent; and
g) The information and monitoring requirements; and
h) Any bond; and
i) The review of conditions of the resource consent.

These details associated with the matters in (a)- (e) are outlined in Section 7.1.2.2, while the matters in (f) to (i) are addressed in the draft conditions of consent for all new bores associated with this application in Section 13.1.

Investigations to ascertain the viability of the bores (whether existing or new) to supply the rates and volumes sought for each bore or gallery intake will include down-hole pump testing. This will be carried out in a manner which will comply with **permitted activity** Rule 12.2.2.3, as:

a) the take will not exceed 2,000,000 litres per day; and will not be carried out for a period of longer than three consecutive days for each bore; and
b) no lawful take of water will be adversely affected as a result of the taking associated with the pump testing.

8.5.1.5 Activity: Construction of a new intake and associated disturbance of bed of waterway

Take T1 will be the only new surface water take, and will be a pump intake. It will be designed to ensure that it complies with permitted activity Rule 13.2.1.4 (erection or placement of an intake structure).

The disturbance of the bed of the waterway associated with establishing this intake structure will be carried out in a manner that will comply with Rule 13.5.1.1 and will be a permitted activity.

8.6 Bundling of Consents

The bulk of the permits being replaced through this application are discretionary activities.

Applications involving a number of different activities with different activity status can be 'bundled' together, so that the most restrictive activity classification is applied to the overall proposal.

This application concerns the replacement of separate permits to take water, but at a catchment scale. All of the primary permits being replaced within the Lindis catchment are discretionary activities, while supplementary takes within the catchment, and primary allocation takes situated outside of the catchment, are restricted discretionary activities.

The bundling approach developed from case law to enable appropriate consideration of the effects of an activity, or group of activities.

Although some of the activities to take and use surface water that are the subject of this application are restricted discretionary activities, the consent authority is still able to have regard to a broad range of matters under Rule 12.1.4.8. In addition, this application represents a catchment wide approach to water management. This means that the effects of the exercising these consents will be inter-linked, particularly during periods of low-flows, when effects are greatest.

The construction of the bores, and associated pump-testing are controlled and permitted activities respectively. The matters which the consent authority has control over for the construction of bores are quite restricted. However the consequential effects of shifting the large race intakes to a number of smaller bores has flow on consequences for in-stream flows and catchment management.

Therefore the approach taken in this application is to bundle the consents and treat the application as a whole as a discretionary activity.

8.7 Key RPW Provisions

Key provisions in the RPW that are of relevance to this application are discussed below.

Schedule 1 Values

> *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.*

Schedule 1A lists the natural values identified for this catchment, while 1D lists the spiritual and cultural beliefs, values and uses of significance to Kai Tahu. The effects of this application on these values are discussed in Section 10.7, and are shown to maintain or enhance these values.

Accordingly, this application is considered to be consistent with relevant Schedule 1 Values.

Natural Character:

> ***Objective 5.3.3*** *To protect the natural character of Otago's lakes and rivers and their margins from inappropriate subdivision, use or development.*
>
> ***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.*

The long history of abstracting water from waterways within the Lindis catchment has impacted on the flow characteristics and ecology of the river. Policy 5.4.8 clearly directs that this use, and associated developments are to be taken into account and acknowledged when assessing the natural character of waterways within the catchment. Notwithstanding this, the topography, natural flow characteristics and ecology of the Lindis catchment have been given particular regard when developing this application (in combination with a minimum flow of 550 l/s). As demonstrated in Section 10.3 and 10.4 this application will result in improvements to the ecology of the river, and a more natural flow characteristic than has been the case under the existing abstraction regime.

Accordingly, this application is considered to be consistent with this objective and policy.

Amenity Values

> ***Objective 5.3.4*** *To maintain or enhance the amenity values associated with Otago's lakes and rivers and their margins.*

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.

As with natural character, the amenity values associated with the Lindis River are influenced by the history of abstraction and the resultant productive land uses which surround it. The banks of the Lindis have been frequented by campers and visitors for many years, with many families returning to camp in the same area for decades. In Section 10.8 it is concluded that these values will be enhanced by the improvement to flows that will result from this application.

Accordingly, this application is considered to be consistent with this objective and policy.

Approach to effects

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.

The evaluations presented in Section 10 clearly indicate that this proposal represents a significant reduction in the effects on the matters listed in Policy 5.4.2(a), and where effects cannot be avoided, they have been significantly remedied or mitigated. In addition, this application seeks the continuation of existing activities, but with changes that will avoid a number of the effects that the current regime of abstraction has. This includes avoiding the extent and duration of low flows caused by abstraction, and avoiding the associated adverse effects natural and cultural values, and the natural character and amenity values of the Lindis catchment.

Accordingly, this application is considered to be consistent with this policy.

Shared management

Policy 5.4.12 *To promote the establishment of, and support, appropriate water user groups to assist in the management of water resources.*

Policy 6.4.0B *To promote and support shared use and management of water that:*
(a) Allows water users the flexibility to work together, with their own supply arrangements; or

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

This application represents a catchment wide approach to water management and directly implements these policies. This proposal will result in the reduction of shared water infrastructure, but as this will result in increased efficiency and a reduction in overall abstraction, this is considered to be positive effect of the proposal.

Accordingly, this application is considered to be consistent with these policies.

Life-supporting capacity

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

The Lindis River currently has life-supporting capacity, as is evident by the ecosystem values identified in Schedule 1A of the RPW. The proposed changes to abstraction contained in this application, coupled with the minimum flow of 550 L/sec will significantly enhance the life-supporting capacity of this catchment. The reduction in the duration and extent of low-flows will also enhance the natural character of the catchment.

The application is therefore considered to be consistent with this objective.

User needs

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

This proposal will result in a reduction in the reliability of supply of water within this catchment. In this regard this proposal will have adverse effects on the agricultural land uses that are dependent on this water. These effects include the inability to fully realise the full potential of existing efficient irrigation infrastructure, combined with the costs associated with developing new infrastructure to implement this proposal.

However, the irrigators within this catchment accept that some adverse effects on their businesses are unavoidable if there is to be an improvement to the flow characteristics and instream ecosystems of this catchment. This proposal reflects an acceptable level of adverse effects on these landowners, and in this respect does meet this objective.

The application is therefore considered to be consistent with this objective.

Minimise conflict between users

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

This application reflects a catchment wide approach to water management in the Lindis catchment. This approach provides a mechanism to manage and minimise conflict among those within this catchment.

The application is therefore considered to be consistent with this objective.

Hydrological characteristics

> ***Policy 6.4.0*** *To recognise the hydrological characteristics of Otago's water resources, including behaviour and trends in:*
> *(a) The levels and flows of surface water bodies; and*
> *(b) The levels and volumes of groundwater; and*
> *(c) Any interrelationships between adjoining bodies of water, when managing the taking of water.*

The hydrological characteristics of the Lindis catchment, and its interrelationship with the Clutha have been given in-depth consideration throughout the development of this proposal alongside the development of an appropriate minimum flow for the catchment. As demonstrated in Section 10, this proposal will restore connectivity with the Clutha River, and will enhance flows in both the upper and lower drying reaches.

The application is therefore considered to be consistent with this policy.

Required amount

> ***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.*

With a minimum flow of 550 L/sec there will be sufficient reliability of supply to disestablish the existing LIC races and replace them with a number of separate gallery intakes. Under this project water will be conveyed for shorter distances via pipelines. The reliability of supply will be sufficient to justify the investment in efficient systems of irrigation.

This application represents a significant reduction in allocation, with the aim that only the water required for the proposed use will be taken.

The local climate, soils, crops and pastures have been taken into account by utilising the Aqualinc approach to calculating the volume of water required to efficiently irrigate the areas specified for each farm.

This proposal is consistent with this policy.

Groundwater considered as surface water

> *Policy 6.4.1A A groundwater take is allocated as:*
> *(a) Surface water, subject to a minimum flow, if the take is from any aquifer in Schedule 2C;*
> *…*

This application includes the establishment of a number of new gallery intakes. With the exception of Take 18 (which is the replacement of an existing permit) these will abstract sub-surface flow from the adjacent waterway. In accordance with this policy these takes have been assessed as being abstraction from surface water.

History of use

> ***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 registered community drinking water supply where an allowance may be made for growth that is reasonably anticipated.*

The rate of abstraction and annual volume sought for each of the replacement consents for primary allocation water within the Lindis catchment takes into account, and is based on, the monitoring records for each point of take. This is further supported by maps of the irrigation command area.

This application is considered to be consistent with this policy.

Minimum Flow

> ***Policy 6.4.5*** *The minimum flows established by Policies 6.4.3, 6.4.4, 6.4.6, 6.4.9 and 6.4.10 will apply to resource consents for the taking of water, as follows:*
> *…*
> *(c) In the case of any existing resource consent to take water from the Lindis catchment area, Luggate catchment area, Manuherikia catchment area (upstream of Ophir) and the Taieri catchment areas Paerau to Waipiata, Waipiata to Tiroiti and Tiroiti to Sutton, as defined in Schedule 2A, upon collective review of consent conditions within those catchments under Sections 128 to 132 of the Resource Management Act.*

The relevant minimum flow is the minimum flow set at the ORC's Ardgour flow recorder, and this application seeks the implementation of a minimum flow of 550 l/s. This is discussed in further detail in relation to Policy 6.4.6 below.

The explanation to this policy makes it clear that the review of consent conditions which will result in the implementation of the minimum flow, will occur (at the latest) on the expiry of deemed permits on 2 October 2021.

However, this application proposes significant changes to infrastructure. These changes to infrastructure cannot occur until there is certainty that the minimum flow is 550 l/s, for the reasons outlined in Section 7.1.2. To provide sufficient time to enable these changes to be made, this application seeks delayed implementation of the minimum flow. This is reflected in the suggested conditions of consent set out in Section 13.

Alternative approach to minimum flow

> *Policy 6.4.6 To consider granting an application for a resource consent to take water from a Schedule 2A river, within primary allocation, subject to a minimum flow lower than that specified in Schedule 2A, on a case-by case basis, provided:*
> *(a) The take has no measurable effect on the flow at any Schedule 2A monitoring site at flows at or below the minimum flow applying to the primary allocation; and*

(b) Any adverse effect on any aquatic ecosystem value or natural character of the source water body is no more than minor; and
(c) There is no adverse effect on any lawful existing take of water.

Take 17 from Shepherds Creek has been assessed as meeting the criteria set out in this policy, as set out in Appendix D on the following basis:

i. Abstraction from Shepherds Creek will have no measurable effect on the Ardgour Road minimum flow site as Shepherds Creek very rarely connects to the Lindis River – usually only during floods
ii. Adverse effects of the abstraction on Shepherds Creek will be very minimal as there are no fish present in this waterway and any surface flow is lost to ground below the take; and
iii. No adverse effect on any other lawful existing take will result from the exclusion of Take 17 from adhering to the minimum flow at Ardgour Road.

Accordingly the approach taken to Take 17 is consistent with and supported by this policy.

All other primary allocation permits within the Lindis catchment being replaced by this application are being sought on the basis of a minimum flow that is lower than specified in Schedule 2A (as amended by Plan Change 5A).

The replacement of these permits will not meet the criteria set out in Policy 6.4.6A(a), as a minimum flow of 550 L/sec is measurably lower than 900 L/sec.

With regard to Policy 6.4.6(b), the proposal put forward in this application will result in less adverse effects on aquatic eco-system values and natural character than a minimum flow of 900 L/sec, for the following reasons (as outlined in Section 10):

i. The proposal includes decommissioning both the Tarras and Ardgour Races and shallow bores below the Ardgour Bridge. By doing this it ensures significant flows pass through the upper losing reach and this will maintain at least 380 L/sec through the upper losing reach for ~90% of the time (at least 720 L/sec through the upper losing reach for ~80% of the time) for flows during the irrigation season. Decommissioning of these races will not be feasible under a minimum flow of 900 L/sec and this would result in greater adverse effects on aquatic ecology and natural character than under the applicant's proposal.
ii. This proposal results in contiguous flows throughout the entire Lindis River to the Clutha confluence, with the majority of the Lindis River length carrying flows above 750 L/sec during low flows (Rekker, 2017).
iii. The proposed minimum flow of 550 L/sec is anticipated to maintain the appearance of braids in the lower river as flows must be maintained above minimum flow for water users to be able to take water.
iv. The applicant also proposes that if flows are held at or below 700 L/sec at the Ardgour flow site for 14 days abstraction will be reduced to deliver a flow pulse of not less than 1000 L/sec at the Ardgour flow site. This will mitigate the effects of a lower minimum flow on the lower losing reach of the Lindis River.

Accordingly, applying a minimum flow of 550 L/sec along with the other measures proposed in this application, will result in positive effects on aquatic eco-systems and natural character when compared to the effects of 900 L/sec. This is because the proposal put forward in this application results in improvements to flows for a much greater length of the river than a minimum flow of 900 L/sec.

With regard to Policy 6.4.6(c), the implementation of a minimum flow of 550 L/sec is not anticipated to have an adverse effect any lawful existing take, as all takes within the catchment will work together to uphold the minimum flow.

Policy 6.4.6 readily applies to the situation of Take 17 on Shepherds Creek. It does not readily anticipate and address the situation outlined in this application, which is far more complex. Accordingly, it should be applied to this application within the context of other relevant objectives and policies. The applicant's proposal is considered to be consistent with all other objectives and policies of the RPW and the RPS and PRPS.

Residual Flows

> ***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.*

A residual flow is not considered necessary for any of the takes located on the main-stem for the following reasons:

- The replacement consents are being sought in parallel to the minimum flow setting process. This means that values likely to be affected by takes on the main-stem have been assessed in considerable detail, at the time this application is lodged.
- The assessment of effects undertaken as part of the minimum flow Plan Change 5A (including further scientific analysis undertaken during Environment Court mediation relating to this plan change) has established that the proposal contained in this application, combined with the a minimum flow of 550 l/s at the Ardgour Road flow site will provide for the aquatic ecosystem and natural character of the source water body.

For takes located on the tributaries, residual flows have been proposed in Section 10.4 in this application document in a manner which is considered to be consistent with this policy.

Transfer of location of point of take and ownership of permits

> ***Policy 6.4.17*** *To approve an application to transfer a consent holder's interest in a resource consent to take and use water in terms of Section 136(2)(b)(ii) of the Resource Management Act, retaining the take's allocation status, providing:*
> *(a) The transfer is within the same catchment or aquifer as the original consent, or both sites are connected in terms of Policy 6.4.1A(a) or (b); and*
> *(b) The total take from the water body following transfer does not exceed that occurring prior to the transfer, as a result of the transfer; and*

(c) The quantity of water taken is no more than that required for the purpose of use of that water, having regard to the local conditions; and
(d) There is no more than minor adverse effect on any other take, any right to store water, or on any natural or human use value, as a result of the transfer.

Takes 6, 11, 12, 13 and 16 are proposed to be relocated as a result of this application. These meet the requirements of this policy:

a) All of the proposed new take locations are within the same catchment as the original permit.
b) The proposed rate and volume to be taken from the new location will not exceed that occurring prior to the transfer – instead there will be a significant overall reduction in the total rate and volume consented to be taken.
c) The amount of water taken is no more than that required for the purpose of use, as set out in Section 6 and 7.
d) The transfer will result in positive effects on natural values, particularly in the case of Takes 11, 12, 13, which will be split up into several smaller gallery intakes. There will be no more than minor adverse effects on any other take, right to store water or human use value as a result of the transfer itself.

The transfer of ownership involved with Takes 15, 16 and 17 also meet the criteria set out in Policy 6.4.17 in the same manner.

Duration of Resource Consents

Policy 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.

A 35 year term of consent is considered appropriate for these resource consents on the following a basis:

a) All of the permits for the taking and use of water as sought by this application have a purpose of use with a long duration.
b) The majority of take points are within a catchment for which a minimum flow has been set (or is in the process of being set)
c) Adverse effects are addressed through conditions including the residual and minimum flow conditions
d) The inclusion of review conditions as conditions of consent are anticipated by the applicant.
e) All permits will be subject to a requirement to be part of a catchment water management group. Adaptive management will occur through the low-flow rationing that will be carried out by this group.

f) The applicants have made significant investments in infrastructure, and the proposal contained in this application will necessitate further significant investments.

g) This proposal will enable the continued shift towards industry best practice in terms of irrigation systems and application methods.

9. Consideration of Alternatives

The 4th Schedule of the RMA requires an assessment of alternative locations and/or methods where it is likely an activity will have any significant effect on the environment. The abstraction of water does have an effect on the environment, and this effect has the potential to be significant if not managed properly, particularly during times of low flows. While significant effects are considered to be avoided by this proposal, investigation of alternative options has taken place.

Extensive investigations of alternative options have been carried out by LIC and Tarras Water Limited, as outlined in Section 1. These investigations highlighted the high cost of sourcing water from an alternative source, and this was deemed to be economically unviable. A small number of properties closer to the Clutha River have obtained consents to take water from that catchment, however this is an expensive option due to the costs associated with pumping the water. All the properties that are likely to have been able to source water from the Clutha have already done so.

For the remainder of irrigators in the Lindis this option is economically unviable and impractical due to costs associated with pumping water. Other limitations on this option are the challenges and costs associated with obtaining the necessary access agreements and easements across a number of titles, as well as obtaining consent to do so.

Options for developing storage and taking water at higher flows have also been considered by a number of the individual land owners. However storage sites within the catchment area limited, and the limited sites that are feasible will only assist irrigators in making up the shortfall in reliability of supply that will result from a minimum flow of 550 L/sec – it does not provide an alternative water source.

The gallery project is a result of an assessment of alternative methods of take and conveyance. This project has been developed to reduce the impact of the 2 large abstractions on the Lindis River, and to improve the efficiency of conveyance. It will result in significant improvements for instream ecology as well as efficiency.

10. Assessment of Environmental Effects

10.1 Introduction

The planning framework within the NPSFM, RPS, PRPS and RPW have a clear emphasis on sustaining life-supporting capacity and ensuring there is a healthy freshwater ecosystem, protecting natural character, maintaining and enhancing cultural values, amenity and recreational values. Environmental flow limits are the key mechanism to achieve this.

Economic and social well-being are to be provided for by enabling use of water, providing the water is used efficiently and within set allocation and flow level limits. The RPS, PRPS and RPW provide a strong policy framework which gives existing users priority to ensure they have a reasonable security of supply and the value of their investment in infrastructure is recognised.

This policy framework is used as the basis for assessing effects on environment, with an emphasis on enhancement, rather than maintenance (many policies require either maintenance *or* enhancement). Effects are assessed within the framework created by these documents, to ensure that the application will result in a healthy eco-system, the protection of natural character, enhancement of cultural, amenity and recreational, whilst also enabling the productive and efficient use of water.

10.2 Effects on Hydrology of Main-stem

Currently there are 14 water takes from the Lindis main-stem and ribbon aquifer upstream of the Ardgour flow site. Most of the water is abstracted from five large open channel irrigation races (Figure 37).

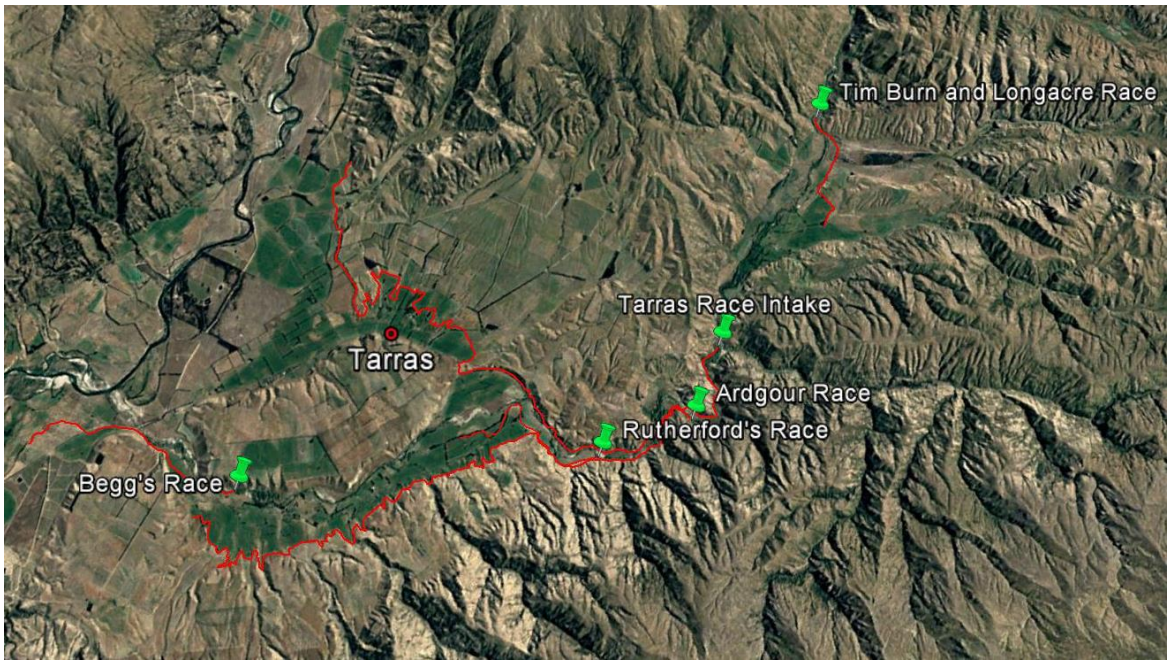

Figure 37. Existing races intakes (green icons) and race lines (shown in red) in the Lindis Catchment.

Historically abstraction from these large races has resulted in large lengths of the lower 25km of the Lindis River going dry (Figure 38). This dewatering has resulted in significant adverse effects on the ecological values of the Lindis with fish kills being well documented (ORC, 2008; Trotter, 2016).

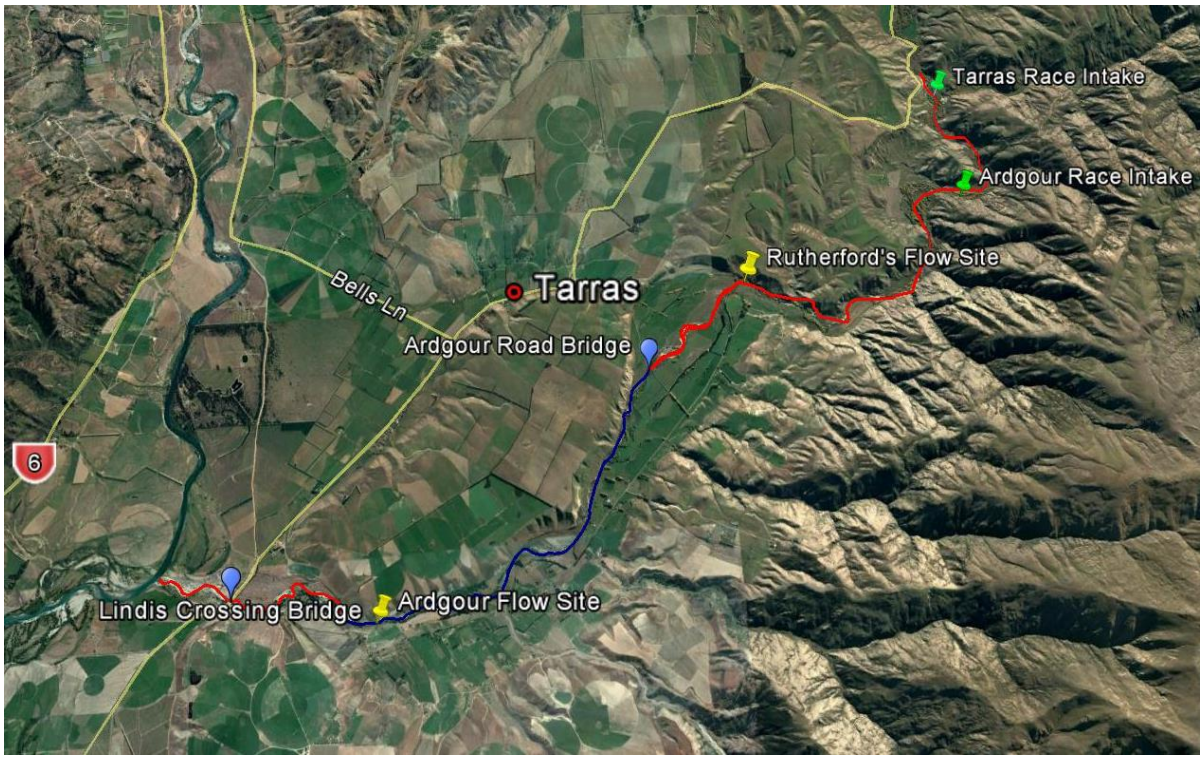

Figure 38. Flowing (blue) and dry (red) reaches under the existing take regime at times of low flow.

LCG proposes to decommission four large races and redistribute them as a series of shallow bore takes. The two largest existing races are the Tarras and Ardgour Races currently take up to 1120 L/sec and 600L/sec respectively. It is proposed that these two races are decommissioned and replaced with shallow bores some 15 Km's downstream with a total combined maximum take of 380 L/sec. By shifting these two major takes downstream and significantly reducing the amount of water taken there is a dramatic reduction of the length of river adversely affected by abstraction (Rekker, 2017).

Two smaller races known as Rutherford's Race (295 L/sec) and the Begg Stacpool Race (101 L/sec) will also be decommissioned as part of this process and replaced by three shallow bores with a total combined take of 305 L/sec.

The assessment of effects assumes that all of the new intakes are from surface water directly from the Lindis River, even though they are proposed as infiltration galleries or shallow bores. This means that the assessment of hydrological effects of these new takes are a worst case for changes in flow as no dampening of drawdown on the river has been accounted for, thus this assessment is likely to be conservative for what is proposed by LCG.

Overall the maximum instantaneous total take from the main-stem (after accounting for connected groundwater takes) of the Lindis River will be reduced from 2893 L/sec to 1326 L/sec. In conjunction

with the redistribution of water takes LCG proposes a minimum flow that applies to all takes within the catchment (except for Shepherds Creek) of 550 L/sec at the Ardgour flow site.

This proposal results in contiguous flows throughout the entire Lindis River to the Clutha confluence, with the majority of the Lindis River length carrying flows above 750 L/sec during low flows (Rekker, 2017).

Analysis by Olsen (2017) and accepted by experts (refer to the Joint Witness Statement in Appendix A) was undertaken to determine the effect the flow has on braiding patterns in the lower Lindis River (below Lindis Crossing Bridge). This assessment found that flows of 600 L/sec or more maintained the appearance of braiding.

It is expected that the LCG proposed minimum flow of 550 L/sec will maintain the appearance of braids in the lower river as flows must be maintained above minimum flow for water users to be able to take water.

Accordingly the proposal put forward in this application will result in significant positive effects to the flow characteristics and hydrology of the Lindis River. It will result in contiguous flows throughout the river and will significantly reduce the extent and duration of low flows in the reaches of the river affected by abstraction.

10.3 Effects on In-stream Ecology of Main-stem

10.3.1 Periphyton Biomass and Fine Sediment

Periphyton biomass and fine sediment are dependent on the time since the last significant flushing flow and frequency of flushing flows (Joint Witness Statement in Appendix A) The LCG flow proposal is not expected to significantly affect the frequency or magnitude of such flushing flows (Joint Witness Statement in Appendix A).

10.3.2 Fish Passage

An assessment of fish passage needs to account for when fish passage is necessary (e.g. spawning migration) and at what time of year or under which flows fish movements occur. Ryder (2017) provides a fish passage assessment of the lower Lindis against the criteria in Gabrielsson and Hay (2017) that is relied upon in this assessment.

Longfin eel

Contiguous surface flows in the Lindis River is considered necessary to allow upstream migration of juvenile eels (Joint Witness Statement in Appendix A). In combination with the minimum flow of 550 L/sec and the shift to gallery intakes below Ardgour Bridge ensures contiguous surface flows throughout the Lindis River (Rekker 2017; Joint Witness Statement in Appendix B).

Adult eels migrate downstream during freshes therefore there is likely to be little effect on adult eel fish passage under the LCG proposal (Joint Witness Statement in Appendix A).

Brown trout

The upper losing reach (above the Ardgour Bridge) and the lower losing reach (near the Lindis Crossing Bridge) have been identified as potential barriers to brown trout passage during times of low flow (Figure 7).

Adult brown trout (>400mm)

Adult trout enter the Lindis River from the Clutha River from late April onwards to spawn over winter where they spend one – two months before returning to the Clutha River (Clutha Fisheries Trust, 2011). Analysis by Ryder (2017) found that flows greater than 2000 L/sec at the Ardgour flow site are required to provide passage for adult brown trout downstream of the Lindis Crossing Bridge to meet the fish passage criteria in Gabrielsson and Hay (2017).

The LCG proposed minimum flow of 550 L/sec does not provide for adult trout passage from the Clutha to the Lindis River. However, as adult trout enter the Lindis River from the Clutha from late April onwards this coincides with the time when irrigation demand is reduced and flows tend to be naturally higher. Analysis of observed flows at Ardgour under the existing take layout for the period Nov 2005 – June 2015 (10yrs) showed that flows recovered to be above 2000 L/sec by the 11th of May at the latest with eight of the 10 years having flows above 2000 L/sec by the end of April. As the LCG proposal reduces water use by over 1500 L/sec and guarantees a continuous flow to the Clutha at all time it should be expected that potential delays in trout migration due to low flows will be reduced compared to what has historically occurred.

The flows required for adult trout passage in the Lindis downstream of the Lindis Crossing Bridge (>2000 L/sec) are significantly higher than the natural 7-day MALF at Ardgour flow site of 1750 L/sec. Therefore, adult trout passage is naturally constrained by low flows in the Lindis River. The minimum flow of 550 L/sec does not restrict adult trout fish passage compared to natural MALF. Furthermore, the minimum flow of 550 L/sec is unlikely to have a significant effect on adult trout migration as flows are naturally higher during the times adult trout migrate in and out of the Lindis irrespective of the minimum flow set (as described above).

Yearling brown trout (180 - 250mm)

Analysis by Ryder (2017) found that flows greater than 1650 L/sec at the Ardgour flow site are required to provide passage for yearling brown trout downstream of the Lindis Crossing Bridge to meet the fish passage criteria in Gabrielsson and Hay (2017).

Natural flows are expected to exceed 1650 L/sec at Ardgour flow site ~92% of the time. It is expected that measured flows at Ardgour flow site will exceed 1650 L/sec ~73% of the time throughout the year and ~63% of the time during the irrigation season under the LCG proposal.

Ryder 2017 also found that flows greater than 720 L/sec at the shallowest survey riffle is required to provide passage for yearling brown trout through the upper losing reach (upstream of Ardgour Bridge) to meet the fish passage criteria in Gabrielsson and Hay (2017).

The LCG proposal is to decommission both the Tarras and Ardgour Races and shift to shallow bores below the Ardgour Bridge. By doing this it ensures significant flows pass through the upper losing

reach and this will maintain at least 720 L/sec through the upper losing reach for ~80% of the time for flows during the irrigation season.

To further mitigate the potential effects on yearling trout outmigration from the Lindis the applicant proposes that if flows are held at or below 700 L/sec at the Ardgour flow site for 14 days abstraction will be reduced to deliver a flow pulse of not less than 1.0 m^3/s at the Ardgour flow site.

Young of the year trout (100 - 150mm)

Analysis by Ryder (2017) found that flows greater than 1300 L/sec at the Ardgour flow site are required to provide passage for young of the year brown trout downstream of the Lindis Crossing Bridge to meet the fish passage criteria in Gabrielsson and Hay (2017).

Natural flows are expected to exceed 1300 L/sec at Ardgour flow site ~98% of the time. It is expected that measured flows at Ardgour flow site will exceed 1300 L/sec ~80% of the time throughout the year and ~70% of the time during the irrigation season under the LCG proposal.

Ryder 2017 also found that flows greater than 380 L/sec at the shallowest riffle is required to provide passage for young of the year brown trout through the upper losing reach (upstream of Ardgour Bridge) to meet the fish passage criteria in Gabrielsson and Hay (2017).

The LCG proposal is to decommission both the Tarras and Ardgour Races and shallow bores below the Ardgour Bridge. By doing this it ensures significant flows pass through the upper losing reach and this will maintain at least 380 L/sec through the upper losing reach for ~90% of the time for flows during the irrigation season.

To further mitigate the potential effects on young of the year trout outmigration from the Lindis LCG proposes that if flows are held at or below 700 L/sec at the Ardgour flow site for 14 days abstraction will be reduced to deliver a flow pulse of not less than 1000 L/sec at the Ardgour flow site.

10.3.3 Trout predation and mortality

The existing flow regime in the Lindis River can result in dewatering of ~16 km of the Lindis downstream of the Tarras Race, this results in significant brown trout mortality (Trotter, 2016). Sections within the gaining reach (Figure 7) become fragmented and juvenile brown trout can become susceptible to predation (Trotter, 2016).

The LCG proposal of a 550 L/sec minimum flow with gallery intakes enhances fish passage compared to the existing flow regime for yearling trout, young of the year trout, native fish and longfin eel throughout the Lindis River upstream of Lindis Crossing Bridge (Ryder, 2017). The LCG proposal reduces the risk of low flows causing fish to become isolated due to habitat fragmentation, thus reducing their risk of predation.

Fish kills due to the historic dewatering of the Lindis River (Trotter, 2016) will no longer occur under LCG's proposal.

Open channel water races with gravel bunding that channel the river flow down the race have been highlighted as significant causes for the loss of juvenile brown trout from the Lindis River (Trotter 2016; Jellyman and Bonnett, 1992). LCG's proposal to decommission the four large races in the lower Lindis and shift to shallow bores will remove this significant loss of juvenile trout. Any other water takes from the main-stem will be screened to prevent the ingress of trout.

Overall the applicant's proposal significantly improves the impacts of water use on trout mortality and predation compared to the existing state.

10.3.4 Fish Habitat

Currently the recorded 7-day MALF is 252 L/sec at the Ardgour flow site (Table 6). Observations at this flow reveal that the river is often dry in the upper and lower losing reaches (Figure 7). The LCG shallow bore proposal with a minimum flow of 550 L/sec is expected to prevent any drying in the Lindis River and maintain high levels of habitat protection in the lower river below the Cluden Confluence.

As identified by experts it is how the magnitude of the minimum flow, allocation rate, location of water takes and the method of abstraction interact to determine the magnitude of flows in the river, and therefore the effects on instream values (Appendix B Joint Witness Statement). Figure 39 below indicates that after accounting for water takes associated with the new water take layout and groundwater losses and gains *in addition* to the minimum flow of 550 L/sec at the Ardgour flow site, most of the lower 25km of the Lindis River will flow significantly above 750 L/sec (Rekker, 2017). In its simplest form, the difference between 'LCG proposed flow' and the 'existing state flow' in Figure 39 can be interpreted as gains in fish and invertebrate habitat.

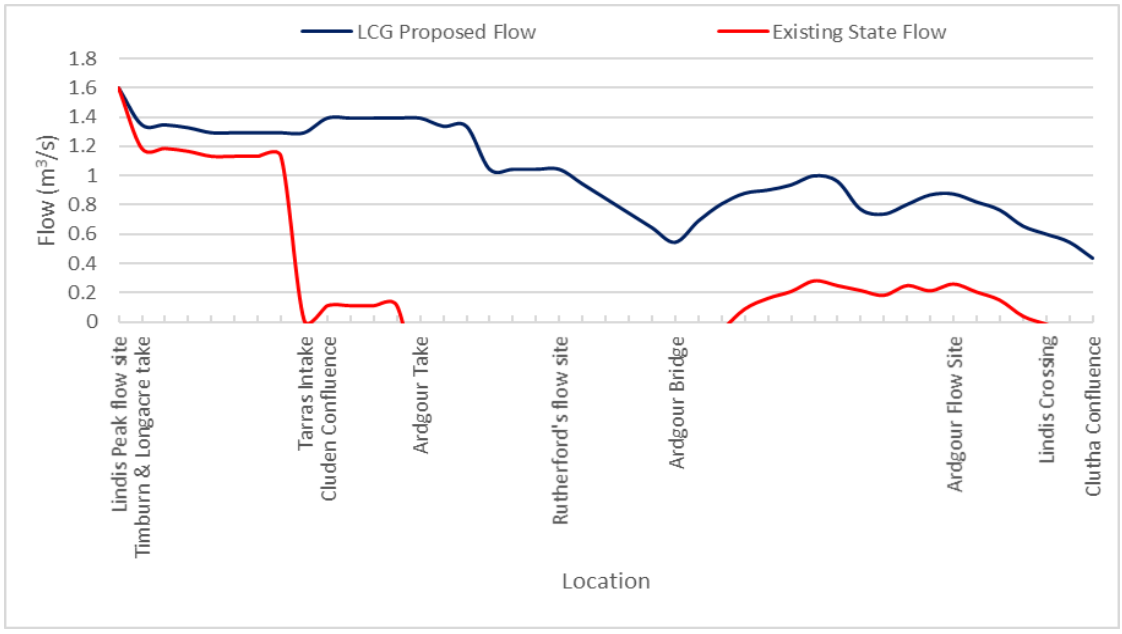

Figure 39. Longitudinal flows for the lower ~25km of the Lindis River comparing the existing state flows to flows expected under the LCG gallery proposal with a 0.550 m^3/s minimum flow at Ardgour with an inflow of 1.6 m^3/s at Lindis Peak.

Through careful planning and accounting for the specific hydrology of the lower Lindis the applicant's proposal mitigates the effects of taking water for a large length of river. The greatest effects are restricted to the lowest 4.5 Km (below Ardgour flow site) where groundwater losses reduce flow below 550 L/sec (Figure 39). However, this needs to be kept in context with the quality of fish habitat in this reach. Habitat quality for fish in the Lindis downstream of Lindis Crossing Bridge at flows below the natural 7-day MALF has been identified as notably worse than upstream due to a combination of physical factors, periphyton and fine sediments (Joint Witness Statement in Appendix A).

At a river scale the LCG gallery proposal with a minimum flow of 550 L/sec at Ardgour provides significant levels of habitat protection acknowledging that a short reach below the Ardgour flow site is lower than upstream. However, it is expected that the habitat gains provided by the new take layout upstream of the Ardgour flow site and in particular upstream of the Ardgour Bridge far outweighs any habitat loses in the river below the Ardgour flow site (Figure 39).

This application puts forward a proposal that represents a significant improvement to fish habitat relative to the existing flow regime and restores fish and invertebrate habitat in the Lindis River.

10.3.5 Summary

The applicant's proposal decommissions all the large open race takes downstream of the Cluden Stream confluence redistributing some of the water historically taken to shallow bore takes. This reduces the total water take from the Lindis main-stem from 2893 L/sec to 1326 L/sec

In combination with a minimum flow at the Ardgour flow site of 550 L/sec the reduction in total take and shifting the takes to shallow bores means that the proposal provides for fish passage (when it is expected to occur) while providing significant improvement to fish habitat relative to the existing flow regime and restores fish and invertebrate habitat in the Lindis River.

10.4 Effects on Ecological Values in the Tributaries of the Lindis River

10.4.1 Overview

The Lindis Catchment Group is looking to renew existing water takes from the tributaries of the Lindis River. Currently there are 16 takes from 14 tributary streams. These streams are:

- Unnamed Spring
- Cluden Swamp Spring
- Tarras Creek
- Shepherds Creek
- Waiwera Creek
- Cluden Stream
- Coal Creek

- Tim Burn
- Eight Mile Creek
- Nine Mile Creek
- Long Spur Creek
- Rocky Creek
- McKenzie Creek
- Station Creek

Many of the tributaries of the Lindis River hold high densities of small brown trout which have no recreational fishery value nor are they likely to contribute significantly to downstream trout fisheries. The key tributary that is the exception to this is Cluden Stream which is a recognised high value trout spawning and rearing stream for the Lindis and Upper Clutha.

Brown trout and upland bullies are the most common species found below takes in tributaries of the Lindis River.

Cluden Stream is the only tributary where Clutha flathead galaxiids occur below a take and it is thought that these individuals have come from trout free tributaries upstream (Daniel Jack, pers comm[4]). Only two populations of Clutha flathead galaxiids in the Lindis appear to be free from competition with trout (Short Spur Creek and Big Spur Creek).

Longfin eels are rare throughout the catchment even in tributaries with continuous flow and ample eel habitat, with few records of their presence after the 1980's. Clearly the lack of eels is not due to a lack of habitat but most likely due to the lack of elvers passing the Roxburgh and Clyde dams on the Clutha River.

Natural low flows in the streams assessed are very low, with many of the streams assessed having natural low flows of 10 L/sec or less.

Nine of the 14 streams assessed dry naturally in their lower reaches due to a combination of groundwater losses and low flows. Often these streams exit confined gorge sections and flow across alluvial gravel reaches before they reach the Lindis River. In most cases the takes from these streams are at the most downstream extent of the naturally flowing reach. In the streams which dry naturally no residual flows are recommended; however, these streams under the existing take regime hold populations of mainly brown trout in their perennial reaches.

Appendix D investigates on a case by case basis whether the application of residual flows for each take is necessary to provide for ecological values. Where streams are shown to flow continuously all year and maintain connection with the Lindis River, residual flows are proposed to maintain the values present in these waterways.

[4] Daniel Jack Freshwater Ranger for the Department of Conservation.

Apart from the minimum flow that applies to all takes in a catchment, residual flows are the key mechanism utilised in the RPW for protecting ecological values in tributaries, especially where the tributary is hydrologically different to the main-stem (refer to analysis of Policy 6.4.7 in Section 8.7).

Residual flows are specific to an individual point of take and apply in concert with a minimum flow (both the minimum and residual flow must be met for water to be taken). A residual flow is the amount of water that must be left at a point of take to provide for ecological values and natural character of that waterbody.

When determining a residual flow, it is important to determine the ecological values to be protected, the natural hydrology of the stream at the point of take and the potential effects of the proposed take on those flows and subsequently the ecological values.

For the purpose of this assessment, if a stream was assessed as drying naturally downstream of the point of take no residual flow has been recommended. In streams that dry naturally it was assessed that drying these reaches for a longer duration would have an effect that was no more than minor.

If a stream was shown to flow continuously below the point of take and maintain a permanent connection to the Lindis River a residual flow has been proposed to provide for ecological values.

In this section, residual flows have either been expressed as a specific flow that must be left to pass the point of take (e.g. 5 L/sec), or as a description such as 'a visible surface flow is maintained below the take to the first tributary entering Waiwera Creek on the true right, approximately 100m below the take'. When recommending a residual flow the length of reach affected and the distance downstream for when tributaries increase flows was considered.

10.4.2 Summary of Residual Flows Proposed for Tributaries

Table 35 summarises the flows and recommended residual flows for each of the tributaries, as assessed in Appendix D.

Table 35: Summary table of flows and recommended residual flows for each take.

Stream	Min Recorded Daily Average flow (m^3/s)	7-Day Mean Annual Low Flow (MALF) (m^3/s)	Proposed Residual Flow Condition	Minimum Flow Applies
Cluden Swamp Spring at Take	No data	No data	No residual flow. The spring is artificial and is heavily modified. Existing spring is captured by LIC races.	No (not connected to the Lindis River)
Unnamed Spring at Take (estimated from take data)	0.012	0.013	a visible surface flow is maintained below the take maintaining upland bully and brown trout below the take.	No (not connected to the Lindis River)
Tarras Creek at Take	No data	No data	No residual flow. The creek is ephemeral and is heavily modified. Existing creek is captured by LIC race.	No (not connected to the Lindis River)
Shepherd Creek at Take	<0.001	~0.001	No residual flow. The stream naturally dries due to a combination of groundwater losses and low flows below the take.	No (not connected to the Lindis River)
Waiwera Creek at Take	0.010	0.015	a visible surface flow is maintained below the take to the first tributary entering Waiwera Creek on the true right, approximately 100m below the take	Yes
Cluden Stream at Take	0.028	0.033	0.005 m^3/s residual flow to maintain surface water connection and provide for ecological values.	Yes
Coal Creek at Take (augmented flow from Cluden Stream)	0.018	0.028	No residual flow. The stream naturally dries due to a combination of groundwater losses and low flows below the take.	Yes

Stream	Min Recorded Daily Average flow (m^3/s)	7- Day Mean Annual Low Flow (MALF) (m^3/s)	Proposed Residual Flow Condition	Minimum Flow Applies
Tim Burn at ORC Flow Site	0.004	0.007	No residual flow. The stream naturally dries due to a combination of groundwater losses and low flows below the take.	Yes
Nine Mile Creek at Take	0.004	0.008	No residual flow. The stream naturally dries due to a combination of groundwater losses and low flows below the take.	Yes
Eight Mile Creek at Take	0.003	0.005	No residual flow. The stream naturally dries due to a combination of groundwater losses and low flows below the take.	Yes
Long Spur Creek at Take	0.008	0.011	No residual flow. The stream naturally dries due to a combination of groundwater losses and low flows below the take.	Yes
Rocky Creek at Take	0.015	0.023	No residual flow. Immediately below its confluence with Long Spur Creek the stream naturally dries due to a combination of groundwater losses and low flows below the take.	Yes
McKenzie Creek at SH 8 Bridge	0.010	0.015	0.015 m^3/s residual flow to provide for the ecological values.	Yes (Supplementary)
Station Creek at SH 8 Bridge	0.012	0.018	0.020 m^3/s residual flow to provide for the ecological values.	Yes (Supplementary)

10.5 Effects on Water Quality

The Lindis River is considered to have very good water quality when compared to other Otago rivers. In the ORC's 2012 state of the Environment water quality report both long term monitoring sites in the Lindis Catchment were in the top four rivers for water quality in Otago (Ozanne, 2012).

Plan Change 6A brought in to effect water quality limits for the Lindis Catchment. Compliance with these limits is determined based on two sites in the Lindis Catchment, Lindis Peak and Ardgour (the proposed minimum flow site). To meet the limits in schedule 15 of the water plan 80% of samples taken when the Lindis Peak flow site is at or below median flow over the preceding five years must meet the specific parameters limits. Table 36 below shows that currently only Nitrate-nitrite nitrogen (NNN) at the Ardgour site fails to meet the Schedule 15 water quality limit.

Table 36: The 80th percentile for water quality parameters when the Lindis Peak flow site was below median flow (July 2011 -June 2016).

Site	NNN (mg/l)	NH4 (mg/l)	DRP (mg/l)	*E.coli* (cfu's per 100 ml)	Turbidity (NTU's)
Lindis Peak (RPW limit)	0.010 (0.075)	0.007 (0.01)	0.005 (0.01)	68 (260)	0.096 (5)
Ardgour (RPW plan limit)	**0.170** (0.075)	0.009 (0.01)	0.004 (0.01)	78 (260)	0.079 (0.5)

In 2016 ORC published a report documenting the water quality in the Lindis Catchment, it found that the likely reason for the Lindis not meeting the NNN limits at Ardgour was because of current abstraction practices (Olsen, 2016). Historically all surface flow is removed from the Lindis River upstream of Ardgour Bridge in the height of summer and flows recorded at Ardgour (often ~0.25 m^3/s) are the result of groundwater gains (refer to Figure 39). Groundwater is often high in nitrogen, as a result the NNN readings at Ardgour are elevated compared to the Schedule 15 limit and the upstream site at Lindis Peak (Table 36).

The applicant's proposal to provide a minimum flow of 550 L/sec with a dramatic reduction in abstraction from the Lindis main-stem will mean that on an annual basis flows at Ardgour will be at or above 1000 L/sec ~85% of the time and continuous flows will be maintained at all times. This increased flow of upper catchment water to the lower catchment will result in more dilution and lower NNN concentrations in the lower catchment at the Ardgour site over time (Olsen, 2016).

As the applicant's proposal does not propose any significant expansion or changes in irrigation area above Lindis Peak it is expected that water quality will continue to meet the water plans Schedule 15 limits for the upper Lindis.

Under the applicant's proposal it is expected that water quality at Ardgour will continue to meet Schedule 15 limits for NH_4, DRP, *E.coli* and turbidity. By providing a continuous flow at all times and reducing abstraction from the Lindis River it is expected that the relative significance of high N groundwater to measured NNN levels at Ardgour will be reduced and these levels will improve significantly.

10.5.1 Nitrogen Leaching

The RPW has set as a permitted activity a leaching limit of 30Kg/ha/year for the Lindis catchment. While this permitted activity rule only comes into effect on 1 April 2020 compliance with this rule is still considered here. This limit applies as an average across the entire property. Historically irrigation in the Lindis has been border Dyke irrigation and contour flood. Both these methods have been identified as susceptible to higher leaching rates than by more modern spray methods (Lilburn *et al.,* 2010; Wilson, 2012). The LCG proposal is to utilise spray irrigation (largely via pivots) to apply water with only limited border dyke irrigation to continue during the shoulder of the irrigation season.

Wilson, (2012) when modelling worst case Nitrogen leaching during the development of plan change 6A, found that in the nearby Hawea Basin meeting the 30 KgN/ha/year permitted activity limits was achievable for dairy farming under spray irrigation. As dairy farming is considered a high N leaching landuse it is fair to expect that other landuses will leach less. Currently there is no dairy farming in the Lindis Catchment.

Further to this most of the landholdings that are proposing to use water are large with the majority of the property being dryland. These dryland areas are likely to be leaching less than 10 KgN/ha/yr thus although it is likely the irrigated areas may be leaching 20 – 30 KgN/ha/yr depending on landuse the overall farm averages will be well under the permitted activity limits of 30KgN/ha/yr.

Currently the greatest water quality risk is not meeting the Schedule 16 discharge requirements that come in to force in 2020. This is because where overland flow from irrigation run-off is reaching streams it is unlikely to meet the Schedule 16 discharge thresholds. Where overland flow is currently reaching waterways in the catchment and causing degradation in water quality it is anticipated this will cease with continued conversion to spray under the applicant's proposal. Through this change is application methods it is anticipated that there will be no increase in nitrogen leaching due to efficiency gains and the ability to keep water (and N) from passing through the root zone (Wilson, 2012).

It is anticipated that through the continued shift to spray irrigation and maintaining significantly improved flows in the Lindis River there will be an improvement in all water quality parameters at the Ardgour monitoring site.

10.6 Effects on Groundwater

While this proposal includes the establishment of new bores/infiltration galleries and the taking of water from these, all of them except for T5, are located within the Lindis Ribbon Alluvial Aquifer.

The Lindis Ribbon Alluvial Aquifer is closely hydrologically connected to the Lindis River (Houlbrooke, 2010). For this reason the effect of taking water from bores or infiltration galleries in this aquifer are considered in terms of effects on surface water, including effects on surface water flows, as noted in noted in Section 10.2. Interference effects on existing bores will be avoided via a condition of consent, as proposed in Section 13.

This application does not include a permit to take water from Take T5, only to construct a bore at this site. The potential effects of abstracting water from this site will be included in a separate application once more is known about groundwater at this site as a result of pump testing.

10.7 Effects on Cultural Values

In order to understand the effects of this application on cultural values, a number of documents have been examined to understand the key values associated with the Lindis catchment and waterways in general.

A Cultural Impact Study: Assessment of Lindis River Flows (referred to as the CIS) was undertaken by Tipa and Associates Ltd (May 2017) as part of the minimum flow plan change process. This has also been referred to in carrying out this assessment of effects on cultural values, however it is noted that the CIS did not include an assessment of the effects of a minimum flow of 550 l/s combined with the proposal addressed in this application.

10.7.1 Kāi Tahu Ki Otago Natural Resource Management Plan (2005)

Kāi Tahu is the principal Māori iwi of the southern region of New Zealand. In Otago the four Papatipu Rūnaka and associated whānau and rōpū are:

- Te Rūnanga o Moeraki
- Kāti Huirapa Rūnaka ki Puketeraki
- Te Rūnanga o Ōtākou
- Hokonui Rūnanga

Associated whānau and röpū include:

- Moturata Taieri Whānau
- Waikoau Ngāi Tahu Rūnanga

The four Papatipu Rūnaka of Otago developed the Kāi Tahu Ki Otago Natural Resource Management Plan (2005). This is the principle planning document for Kāi Tahu ki Otago, a consultancy service acting on behalf of these Rūnaka (note that Kāi Tahu ki Otago has now been rebranded as Aukaha).

The over-arching principles governing this document include that of manawhenua, kaitiakitaka (guardianship, care, and wise management) and the protection of Mauri, or the protection of the life giving essence of an ecosystem.

This document identifies issues for the Otago Region as a whole, and these include over-allocation of water and inefficient use of water. Relevant policies focus on only granting the amount of water necessary for the proposed use of water and to encourage efficient use of water.

10.7.2 Te Runanga o Te Ngāi Tahu's Freshwater Policy

Kāi Tahu's Freshwater Policy provides an indication of the issues and values relating to freshwater management that are of particular concern to Kāi Tahu and the interested Papatipu Runanga.

Values identified in the Freshwater Policy that can be affected by abstraction/diversion include:

- Mauri – life-giving essence of a resource. Maintenance and enhancement of Mauri is identified as the primary management principal for Kāi Tahu. One method of doing so is the establishment of minimum flow levels that afford protection to instream values
- Kaitiakitanga – responsibility for the preservation of the integrity of valued waterways
- Rahui – places where restrictions were placed on an area or resource for a given purpose the prohibits a specific human activity.

Water quantity is one of the key issues identified for freshwater. A number of objectives and policies are included within the Freshwater Policy to ensure values of importance are protected. These emphasise the importance of protecting, maintaining and restoring the Mauri of waterways, and Mahinga Kai, as well as the identification and protection of Wahi Tapu sites and the support and facilitation of Kaitiakitanga.

10.7.3 Evidence of David Higgins to ORC Hearing on Plan Change 5A

David Higgins, (Upoko, Te Rūnanga o Moeraki) presented evidence on the cultural values and beliefs associated with the Lindis catchment. This evidence highlighted the importance of the Lindis as part of the ancient trails of Kāi Tahu, and its role in mahika kai (food gathering) traditions and the presence of several nohoaka (seasonal campsites) within the catchment. David's evidence highlights the importance of the Lindis River flowing into the Mata-au (Clutha River), and notes that as kaitiaki, Kāi Tahu are aiming for optimum habitat for mahika kai and taoka species, not a habitat that supports mere survival.

10.7.4 Schedule 1D of RPW

Schedule 1D of the RPW identifies spiritual or cultural beliefs, values or uses associated with water bodies of significance to Kai Tahu.

This schedule identifies the following values and customary use interests for the Lindis River:

- Waahi taoka – treasured resource; values, sites and resources that are valued and reinforce the special relationship Kai Tahu has with Otago's water resources.

- 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).

10.7.5 Values highlighted during consultation

Consultation with iwi as part of the minimum flow plan change and in preparing this consent has highlighted several of the values above, with a particular focus on:

- Restoration of a meaningful continuity of flow in the Lindis River – a good flow rather than a trickle
- Protection of the Mauri of the Lindis River
- Efficient use of water and a reduction in over-allocation
- Access along the River
- Protection and enhancement of nohoaka sites
- Protection and enhancement of native fish species and their habitat, particularly galaxiid populations in tributaries.

10.7.6 Effects of this proposal on cultural values and beliefs

A large proportion of irrigation in this catchment utilises efficient application methods including centre pivots and k-lines. The proposal contained in this application will facilitate investment in, and development of, further efficient irrigation systems within the catchment. The allocation requested for each of the permits reflects the amount necessary for the intended use, and have been determined based on the land use type and area of irrigation. The application also represents a significant reduction in allocation within the catchment.

In this respect the application is considered to be consistent with the values of Kāi Tahu as expressed by the policies associated with efficiency and over-allocation in the Kāi Tahu Ki Otago Natural Resource Management Plan, and during consultation relating to the minimum flow plan change process and this application.

The proposal outlined in this application will result in significant improvements to flows within the Lindis catchment. It will result in surface flow connectivity with the Matau/Clutha River and the extent and duration of low flows will be significantly reduced. This will result in the enhancement of the Mauri of the Lindis River and will result in a healthy river system. Consultation with iwi indicates this proposal will satisfy their goals around restoration of meaningful connectivity and the Mauri of the Lindis catchment.

Mahika kai habitat will be improved by this proposal, by providing sufficient in-stream flows via the minimum flow and residual flows, and dis-establishing the large race intakes. However, other limiting factors, including lack of passage past the dams on the Mata-au/Clutha River for eels, and predation of native fish species by trout are likely to have an adverse impact on the abundance of mahika kai species. These factors are outside the control of the applicants. However the applicants

are committed to working with Kāi Tahu and the Department of Conservation to protect existing populations of native fish species in the tributaries, and to investigate the transfer of native fish species to identified tributaries.

Improvements to the flow characteristics are also likely to result in a corresponding improvement to the values associated with nohoaka sites. Consultation with iwi indicates this is the case, although access to some of the most improved reaches (downstream from Take 11 and 12), will need to be obtained through private discussions with the relevant landowners. These landowners are members of LCG, and as noted in Section 10.8 many of these landowners already welcome campers onto their land.

Overall this proposal is anticipated to enhance all of the cultural values associated with the Lindis River and its tributaries, and will avoid or minimise a range of effects that the current regime has had on these values.

10.8 Effects on Recreational Values

Recreational values associated with the Lindis River include fishing, camping and, picnicking.

The Lindis River is currently identified as "a major spawning and juvenile trout rearing stream that is important for juvenile trout recruitment to the nationally important Clutha River system and Lake Dunstan fisheries."[5] However, the spawning and juvenile rearing value of the Lindis River is limited by the current regime of abstraction, particularly the loss of surface flow in the lower reaches. [6]

Lake Dunstan was filled in 1993 and there was extensive debate as to whether the new lake would be recruitment limited and therefore struggle to become a significant fishery. Neither the Upper Clutha or Lake Dunstan have been shown to be recruitment limited and the proposed hatchery that was required by conditions imposed by the government when the Clyde Dam was built was deemed unnecessary for that reason (Jellyman, 2011). As a result the Clutha Fisheries Trust (CFT) was formed. The CFT website states the following:

> *"However, the need (or otherwise) for a sports fish hatchery became the subject of debate. The general consensus among fisheries managers was that natural recruitment would be* sufficient to maintain a satisfactory sports fishery."[7]

Both Lake Dunstan and the Upper Clutha fisheries sustain high amounts of angling pressure in excess of 40,000 angler days per annum between them (Unwin, 2009), and are second only to Lake Onslow for the highest bag limits for trout in the Otago region with six fish per person per day (Fish and Game fishing regulation for 15/16 season). It is expected that as the LCG proposal represents a significant improvement to the existing state of the Lindis River and that its contribution to the nationally significant trout fisheries of the Upper Clutha and Lake Dunstan will be enhanced.

[5] Evidence of Morgan Trotter, 2016, ORC Plan Change 5A Hearing, paragraph 1 under heading "Fisheries Values" referencing Jellyman 1990, Jellyman & Bonnett 1992, ORC 2006, Otago Fish and Game Council 2015
[6] Evidence of Morgan Trotter, 2016, ORC Plan Change 5A Hearing
[7] www.cluthafisheries.co.nz/the_trust.html.

The Lindis River is also recognised as a locally important trout fishery in its own right, with some 330 angler visits during the seven month angling season. The Lindis River is valued for its proximity to holiday homes, its ease of access and its scenic values. Anticipated catch rate and fishable area were both low and are likely to have been affected by the extended periods of low flows in the lower reaches of the Lindis during the irrigation season.[8]

The banks of the Lindis River have long been frequented by campers, with most of the sites located on private land. The location of these are shown in Figure 40.

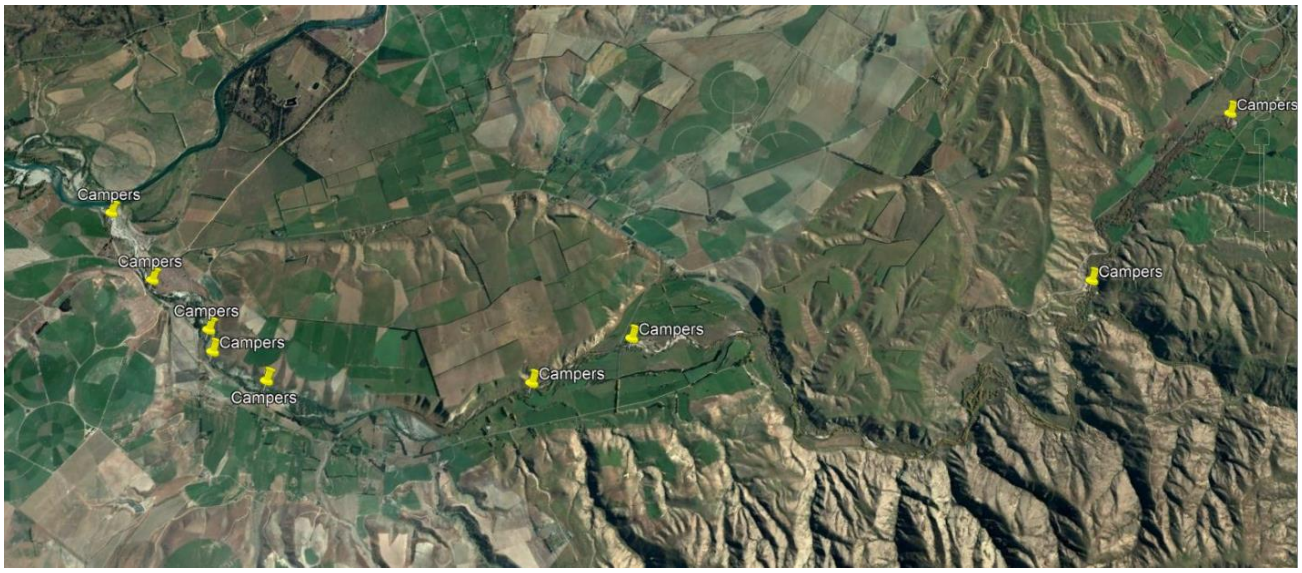

Figure 40: Location of camping spots along the Lindis River

LCG members talked to campers in the 2014 and 2015 summer holidays to understand their association with this location better. The majority of these campers are family groups that return annually to the river for a quiet holiday. Families have been coming to the same spot for between 5 and 50 years and described camping beside the Lindis as peaceful, quiet, safe, and accessible. The camping experience of these groups has been impacted by both floods and lower flows, both of which limit swimming. Campers noted that other factors besides flow can affect their enjoyment of the area, including didymo and odour. Given that many of these sites are located on private land, this recreational use is strongly linked to positive relationships with local landowners.

The same areas (particularly the lower reaches of the river) are also visited by day trippers for a picnicking and playing in and near the river.

The proposed changes to the existing abstraction regime will result in improved flows throughout the reach of the Lindis River frequented by campers. The disestablishment of the races and reduction in abstraction will significantly improve flows in the upper losing reach (current site of Tarras Race intake to Ardgour Road Bridge – refer to Figure 7) and in combination with the minimum flow these measures will result in significantly improved flows throughout the reaches of the Lindis

[8] Evidence of Morgan Trotter, 2016, ORC Plan Change 5A Hearing

River affected by this application, including the lower losing reach (below Ardgour flow site to the confluence with the Clutha).

As noted in Section 10.2 the improvements to the flow regime in the main-stem will enhance habitat for trout, which is expected to improve the recreational fishing experience in the Lindis River. It is also expected to lead to improved juvenile trout recruitment to the Clutha River system and Lake Dunstan fisheries, and so will improve the recreational fishing experience there also.

The reduction in the extent and duration of low flows, and the maintenance of surface flow connectivity with the Clutha River that will result from this proposal will also enhance the recreational experience of campers and other visitors such as picnickers.

Accordingly, this application is anticipated to result in significant positive effects on the recreational values associated with, and supported by the Lindis catchment, to the point that recreational values will be enhanced and provided for.

The tributaries (including the tributaries in the Tarras area) have low recreational values, besides use by the farming families who live in this area. The implementation of residual flows on the tributaries which would naturally maintain surface flow connectivity with the Lindis River will enhance any such recreational values.

10.9 Effects on natural character

The natural character of a waterway is influenced by a range of factors including flow characteristics, structures within the bed, riparian management, and water quality (including colour and clarity), and the ecology of the river and its margins. The extent of use of the waterway and development within and around should be taken into account in assessing the degree of naturalness associated with a particular waterway (Policy 5.4.8 of the RPW).

The section of the Lindis River affected by this application stretches from Station Creek to the confluence with the Clutha River. In general terms the Lindis catchment becomes increasingly more developed the closer it gets to the confluence with the Clutha River. As the river flows towards the Clutha, the valleys it passes through become increasingly open and accessible and so lend themselves more readily to irrigation, dwellings, farm buildings and a small amount of horticulture and viticulture. There is a long history of pastoral land-use within the part of the catchment affected by this application, the development of which has been heavily dependent on the abstraction from waterways within the catchment.

Not surprisingly, the effects of abstraction on the natural character of the Lindis River also increase in proximity to the confluence with the Clutha River.

The upper reaches of the affected area of the Lindis River (Station Creek confluence to Cluden Creek confluence) have the highest degree of naturalness.

There is only one take point situated on the main-stem in this reach (Take 5), but a number are located on tributaries. The takes on the tributaries have a limited effect on the natural low flow characteristics in the main-stem, as 6 of the 9 tributaries (counting Rocky Creek as a separate tributary) would not connect with the Lindis River under natural low flow conditions as outlined in Section 10.4.

There are few structures (including intake structures) within in this reach. Topography along this reach varies markedly and includes confined, steep valleys as well as more open valleys. This influences the land use around the river – in the more open valleys irrigated pastoral land use is evident. State Highway 8 tracks alongside the River throughout this reach and decreases the naturalness of the river.

The mid-reaches of the affected area of the Lindis River (Cluden confluence to Ardgour Bridge) has a lower degree of naturalness. This is due to the presence of the large race intake and by-wash structures in the riverbed associated with Takes 11, 12 and 13 combined with effect of the large amount of abstraction that occurs at these points. In the vicinity of these takes the Lindis River might otherwise have a reasonable level of naturalness, as it is located away from a public road and other developments.

Within the Ardgour Valley the natural character of the river is impacted by the development and use of water in this more open valley, and the associated development, including dwellings, life style blocks, and farm infrastructure, as well as the Ardgour Bridge. Under the existing regime the cumulative effects of abstraction can result in extended periods of low flows along this reach of the river, including a dry river bed in the upper losing reach (Tarras Race intake to the Ardgour Bridge).

The natural character of the lower reaches of the affected area of the Lindis River are impacted by the combined impacts of abstraction and natural losses to ground. This has resulted in the lower reaches of the river forming a single braid, when under natural flow characteristics several braids would be likely to form. Abstraction also results in connectivity with the Clutha River not being maintained during the summer. The river is also crossed by the State Highway 8 bridge (known as the Lindis Crossing).

The ecology of the river is impacted by a range of factors, including abstraction, trout predation on native fish, loss of vegetation, and the presence of large dams on the Clutha. Water quality is generally good throughout the catchment. Exotics species are evident along the entire length of the riparian margin in the reaches affected by this application.

Based on these factors, the Lindis River has a moderate degree of naturalness. In terms of this application the natural character of the River is particularly compromised by the current regime and its impact on flows and infrastructure associated with abstraction. This is most evident around the large race intakes (Takes 11, 12, 13 and 16), and the lack of braiding in the lower reaches and lack of connectivity with the Clutha River.

The introduction of a minimum flow of 550 l/s will avoid the lack of connectivity with the Clutha River, and will also increase the extent of braiding in the lower reaches (Olsen, 2017). It will also significantly reduce the extent and duration of low flows caused by abstraction.

The disestablishment of the large races will significantly enhance flows from Cluden Stream confluence through to the Ardgour Bridge, and will result in the removal the intake structures associated with these races from the bed of the river.

These will be replaced with gallery intakes – as these are subsurface, they will result in a gentler, unobtrusive method of abstraction, and place the infrastructure associated with abstraction (including pipelines and pump stations) further from the active channel of the river. This will result in notable improvements to natural character – by improving instream flows and allowing the riverbed to revert back to its natural form.

The improvements to instream flows that will result from these changes will have positive effects on the instream ecology of the Lindis River, as outlined in Section 10.3.

The combined effect of these changes is expected to be a significant increase in the degree of naturalness from the Cluden Stream confluence through to the confluence with the Clutha. Accordingly this proposal will result in significant positive effects on natural character, so that the existing natural character will be protected and enhanced.

The 4 take points located near the Tarras township (Takes 31b and c, Take 32 and proposed Takes 21, 22) are from outside the Lindis catchment as mapped by Plan Change 5A. However, these takes will effectively replace a portion of the water taken from the Lindis River via the Tarras Race, and in doing so help enable the disestablishment of this race and a corresponding increase in the natural character of the Lindis River. These 3 takes are located in a highly modified pastoral environment, and rely on waterbodies which flow due to the modified hydrology associated with irrigation practices. These waterbodies are disconnected from any natural waterbody.

Accordingly these takes will not have an adverse effect on natural character, but will assist in improving the natural character of the Lindis catchment.

The tributaries within the Lindis catchment that are affected by this application often have a high degree of natural character above the take points. However, at and below the take points a number of the tributaries tend to enter a more developed pastoral setting as they exit hill country gorges and make their way towards the Lindis River. Natural low flows in these tributaries have been assessed as being very low, and this is reflected in channels which look more like depressions or dry gullies in paddocks than stream beds. Those that do flow (Station Creek - Take 1, McKenzies Creek – Take 2, Cluden Stream - Take 7 and Waiwera Creek - Take 14) have a somewhat higher degree of natural character at and below the take point, as the flows in these streams allow for the maintenance of a defined stream bed.

The residual flows that are proposed for Take 1 on Station Creek, Take 2 on McKenzies Creek, Take 7 on Cluden Stream and Take 14 on Waiwera Creek will protect and enhance the existing natural character of these tributaries. The takes from the remaining tributaries will have very minimal

effects on natural character due to the very low, to no, surface flow that would occur naturally below these take points.

10.10 Effects on Amenity

Amenity values are those natural or physical qualities and characteristics of an area that contribute to people's appreciation of its pleasantness, aesthetic coherence, and cultural and recreational attributes.

The amenity of the Lindis catchment is closely linked to the rural character of the area, including the existing pastoral land-use and sparse development in the area, as well as the hot, sunny summers. The Lindis River provides a focal point for amenity values, particularly as many of the cultural and recreational values associated with the catchment are linked to the River.

This proposal has been assessed as having positive effects on natural character, ecological values, recreational, and cultural values. The improvements to the flow characteristics of the Lindis that will result from this proposal will also have corresponding positive effects on amenity values associated with the catchment.

10.11 Effects on Downstream Users

The applicant represents almost all holders of permits to take and use water in the Lindis catchment, and the effects of taking and use of this water by each abstractor on the ability of others to abstract water is accepted by all other members of LCG. This reflects the catchment based approach to water management. The rationing regime that will be developed by LCG and adhered to by all permit holders in the catchment (via conditions of consent on all permits) will support an equitable approach to sharing water during times of low flows, to ensure the effects of water shortages are equally borne throughout the catchment.

Downstream water users will benefit from the proposed significant decrease in abstraction combined with the implementation of minimum and (where appropriate) residual flows that form part of this proposal, as more water will flow into the Clutha River as a result of this proposal.

Accordingly the effects of this proposal on downstream water users are likely to range from minimal adverse effects to positive effects on other users.

10.12 Economic Effects and Value of Investment

Irrigation is accepted as having positive economic effects on farming businesses, including by increasing productivity, protecting farms from the vagaries of climatic events, and allowing finishing on farm. While the economic benefits of irrigation are dependent on a range of factors - including the cost of irrigation (related to factors such as distance from source, infrastructure requirements), climate, soil types, effective farm management – the reliability of the supply of water is one of the key overriding factors.

Farming practices within the Lindis catchment are reliant on irrigation water, given the climatic and physical characteristics of the area. Irrigation in the area has developed based on confidence in continued access to water, along with a reliability of supply that has only been limited by what is physically available in the Lindis catchment.

This has led to a significant investment in irrigation infrastructure throughout the catchment, over many decades. This is an ongoing process influenced by factors such as technology and policy changes. Otago Regional Council has had a strong policy emphasis on efficient irrigation practices for many years. This policy has resulted in the shift towards increasing use of spray irrigation, including centre pivots in the Lindis catchment.

The value of investment in irrigation infrastructure (excluding LIC infrastructure) is estimated to be at least $8,931,134. This includes irrigation infrastructure, pumps, dams, pipes, and the cost of land preparation for the type of irrigation system, electrical infrastructure and monitoring equipment.[9]

The value of investments related to the existing water permits go beyond this figure, as they also include the investments made in retaining a sufficient reliability of supply so that irrigation (particularly efficient irrigation), remains viable. This includes investigations in alternative sources of water and involvement in the minimum flow plan change process. Substantial time and effort was made by the local community, along with the ORC, into investigating the option of bringing water from the Clutha River into the Lindis catchment.

Irrigation (and the investments made in irrigation) has flow on impacts for investment in other parts of each business, as the increase in productivity and ability to finish more stock on farm lead to better returns and development of other farm infrastructure and employment of staff.

Continued access to water is sought via replacement of the permits that are the subject of this application. The physical characteristics of the Lindis catchment mean that irrigation adds very significant value to farming businesses in the area – without access to water for irrigation, these farms would have much lower stocking rates and would not be able to finish any stock on farm. This would result in significant adverse economic effects on the farming and other businesses that are dependent on this water.

While this application seeks replacement of permits to take and use surface water, all of the replacement consents within the catchment (except for Take 17 from Shepherds Creek) will be subject to a minimum flow within the Lindis River, and where appropriate, the takes from the tributaries will be subject to a residual flow.

The minimum and residual flows are the core mechanisms to avoid or mitigate adverse effects on a range of natural and cultural values, and the applicants accept the necessity of the minimum and residual flow. However, the introduction of a minimum flow of 550 l/s will result in a decrease in the reliability of supply.

[9] Estimate carried out by LCG

Estimates of the economic impact on the decrease in reliability of supply resulting directly from a minimum flow of 550 L/sec (or 900 L/sec) have not been carried out, however estimates relating to a minimum flow of 450 L/sec and 750 L/sec were carried out as part of the Plan Change 5A process.

Based on the current area irrigated by water taken from the Lindis catchment (3833 ha), irrigation has been estimated to result in 29 full time equivalents (FTEs), with a further 67 FTEs employed off farm in the area, giving a total of 97 FTEs based on existing irrigation. On farm employees were calculated to reduce by 7 FTEs at a minimum flow of 450 L/sec and 12 at a 750 l/s minimum flow.[10]

The imposition of a minimum flow and the resulting loss in reliability of supply for irrigation has been estimated as resulting in a loss of on farm revenue of between $3 million (450 L/sec minimum flow) and $4.96 million (750 l/s minimum flow).[11]

This has also been expressed as a drop in returns of between 21% (at a minimum flow of 450 L/sec) and 41% (at a minimum flow of 750 L/sec). This is in part caused by reduced pasture growth and quality which results in a reduction of the number of stock that can be finished on farm.

As the reliability of irrigation decreases, the value of the farm would also decline due to the higher risk resulting from lower production. Land asset values were calculated to reduce by between 12% (450 L/sec) and 25% (750 L/sec).[12]

The combination of the lower capital value and trading losses would make it hard for the business to continue being funded by external debt providers. There would be insufficient cash available to support staff and owners. This has the potential to make farms financially unsustainable.[13]

The calculated economic effects of a minimum flow of 450 L/sec and 750 L/sec highlight the value that irrigation brings to a farming business, as well as providing an indication of the adverse economic effects that will result from the implementation of a minimum flow of 550 l/s on the relevant permits. At the more extreme end, it also provides an indication of the economic effects that a decision to decline this application altogether would result in. This would result in many farming businesses becoming economically unviable, and would cause severe adverse economic effects on the majority of the businesses represented by this application.

The applicants acknowledge the necessity of a minimum flow restriction to enhance a range of values associated with the Lindis River. The implementation of a minimum flow on the replacement consents will result in adverse economic effects on the farming businesses that will be subject to a minimum flow. However, continued access to water for irrigation at the level of reliability created by a minimum flow of 550 l/s will enable current farming businesses to remain economically viable.

The proposal put forward by the applicant includes a range of measures, including a minimum flow, residual flows, reduction in allocation and disestablishment of large race intakes. These measures aim to maximise the potential for positive effects on the values associated with the River, while also

[10] Collier, 2016, Evidence for LCG presented at ORC Hearing on Plan Change 5A
[11] Collier, 2016, Evidence for LCG presented at ORC Hearing on Plan Change 5A
[12] Porter, 2016 Evidence for LCG presented at ORC Hearing on Plan Change 5A
[13] Porter, 2016 Evidence for LCG presented at ORC Hearing on Plan Change 5A

minimising the adverse economic effects that will result from a decrease in reliability of supply caused by the minimum flow.

10.13 Social Effects

The Lindis catchment is socially connected to, and part of, the Tarras area. The Tarras area extends to the Lindis Valley and Lindis Pass, over to the Clutha River, down to Bendigo, along State Highway 8A to the territorial boundary near Luggate and the surrounding area (Central Otago District Council, 2007)).

The population of the Tarras area is in the range of 205 to 230 people.[14] The Tarras Community Plan (Central Otago District Council, 2007) describes the area as being populated by families with a strong sense of connection to the area. Many families have been here for generations, with ancestors attracted by either the goldrush or farming opportunities. More recently it has drawn newcomers who are attracted to the region but want to avoid higher land prices experienced in Wanaka or Cromwell – this is evident in the development of lifestyle blocks in the Ardgour Valley. There have also been new residents moving here with the development of viticulture opportunities in the area.

The Tarras Community Plan outlines the social infrastructure in the area:

> *"Tarras itself has a school with a swimming pool, local play group, church, golf course, domain, hall and tennis court area, the garage, the retail services and its own rural fire service. There is a wide range of social infrastructure available to Tarras from the Cromwell and Wanaka areas (both less than 30 mins travel by car) including health services, the rest home services, volunteer ambulance/St Johns, doctors and dentists. There are also several churches representing a number of different denominations, early childhood education facilities, primary schools, Cromwell College and Mt Aspiring College as well as the Otago Polytechnic Cromwell Campus and campus services at Wanaka. School buses travel from the Tarras area to both Wanaka and Cromwell areas."*

The Tarras school employs one full time teacher and one part time teacher and has 10 children attending.[15]

Employment as a result of irrigation within the Lindis command area has been calculated to result in 29 FTEs on farm, and a further 67 FTEs employed off farm in the area, giving a total of 97 FTEs. The granting of replacement permits sought by this application would facilitate continued employment of the majority of these FTEs and a relative stability in population levels. However, the implementation of a minimum flow is likely to result in the loss of approximately 10 FTEs (based on the range given in Section 10.11 for a minimum flow of 450 L/sec and 750 L/sec).

[14] Collier, 2016, Evidence for LCG presented at ORC Hearing on Plan Change 5A and Central Otago District Council, Tarras Community Plan, 2007

[15] Collier, 2016, Evidence for LCG presented at ORC Hearing on Plan Change 5A

Within the context of a total population in the area of 205-230 people, this is likely to result in adverse social effects – for example it may result in a reduction in population, and a corresponding drop in the school role.

However, as noted already, the applicants acknowledge the necessity of a minimum flow restriction to enhance a range of values associated with the Lindis River. As with economic effects, the proposal put forward by the applicant will minimise the adverse social effects that would result from a higher minimum flow (greater than 550 L/sec).

10.14 Effects on Heritage Values

The New Zealand Heritage List/Rārangi Kōrero (formerly the Register) provides information about New Zealand's significant heritage places. This list does include any places or values that will be affected by this application.

Accordingly this application will not result in adverse effects on heritage values.

10.15 Effects of Transfer of Location of Points of Take

Transferring the location of points of take on the main-stem (Takes 11, 12, 13, 16) will result in the disestablishment of the large race intakes, and the establishment of new gallery intakes.

The effects of disestablishing the large race intakes have been discussed in the relevant sections of the AEE above and as noted in those sections will result in enhancement of:

- natural flow characteristics, particularly in the reach upstream of the Ardgour Bridge
- instream ecology
- cultural values
- natural character, including from removal of race intake structures
- amenity
- recreational values

The disestablishment of the race intakes will result in decommissioning of the main irrigation races used in the catchment.

The existing intakes consist of ageing and historic head works and take points that are at a very high risk of a catastrophic failure. Most of the intakes and races were built in the 1920s and hundreds of meters of concrete lined races are in various stages of collapse from rotten concrete, land subsidence and run through large rocky bluffs with high water losses from leaks.[16] The much needed extensive and costly work required to bring this infrastructure up to standard have been on hold until the outcome of the minimum flow plan change process and this application is known.

[16] Evidence of Bruce Jolly as Chairman of LIC, presented at ORC Hearing on Plan Change 5A, 2016

The transfer of the location of points of take from the large race intakes to several smaller gallery intakes will result in replacement of this aging infrastructure and will result in more efficient conveyance of water, as water will be conveyed by new pipelines to the area irrigated.

The new gallery intakes will be sited away from the riverbed in paddocks along the Ardgour Valley. The intakes will be sited to avoid drawdown effects on other bores. This will be confirmed by suitable investigations and assessments by drillers and groundwater hydrogeologists when constructing new bores, or testing existing bores. This will be ensured via a condition of consent requiring this.

Any infrastructure associated with these bores will be in keeping with farm related infrastructure and so is not anticipated to have any adverse effect on natural character or amenity values.

As the bores are located within the Lindis Ribbon Alluvial Aquifer, they are essentially a take from the sub-surface flows of the Lindis River. This is acknowledged in the RPW, which requires takes from these bores to be treated as surface water (Rule 12.2.3.1A, Policies 6.4.0 and 6.4.1A). This means that abstraction from these bores will be subject to the minimum flow. This will ensure that the effects of taking water from these bores on flows in the Lindis River will be mitigated so that the values associated with the Lindis River are enhanced and provided for as outlined in the sections above.

The transfer of the location of Take 6 (Timburn Creek) will ensure the location specified on the replacement consent reflects the existing location to the intake. The intake structure itself will not shift. Accordingly no effects will result from the change in location on paper.

The effects of ceasing these permits altogether would result in severe adverse economic effects to a number of the farming families and businesses reliant on this water as these takes represent a significant portion of the primary allocation water in the catchment. An alternative source of water with a similar reliability of supply is not available, as no more primary allocation is available in this catchment.

Ceasing these permits altogether would result in a reduction in abstraction from this portion of the Lindis main-stem. This means that the cessation of these takes would result in significant gains for instream flows, and thus would result in significant enhancement in a range of related values such as instream ecology, natural character and cultural values. However, the effects of ceasing these permits altogether would result in severe adverse economic effects to a number of the farming families and businesses reliant on this water as these takes represent a significant portion of the primary allocation water in the catchment. An alternative source of water with a similar reliability of supply is not available, as no more primary allocation is available in this catchment.

The cessation of the permits would also result in significant inequity within the catchment and would result in significant adverse social effects also.

10.16 Effects of Transfer of Ownership of Permits

The transfer of permits to a new consent holder for Take 15, 16, 17, 31a will not result in any new or different effects on the environment. Water will be used within the same catchment as it is currently used (in the case of Take 31a this is outside of the Lindis catchment as defined by Plan Change 5A), and water will still be used for the same purpose.

The effects of ceasing these permits altogether would result in the loss of access to primary allocation surface water from the Lindis catchment with the following consequences:

- Take 15 – Would be unable to continue as a viable pastoral unit with a combination or dryland and irrigated land
- Take 16 – Would be unable to develop vineyard on site and would not realise full potential of value add
- Take 17 – Would need to source all irrigation water from the Clutha River. An increase in the use of this water would be prohibitively expensive for this farm, due to the pumping costs associated with it. Current storage dam used for water from Take 17 would no longer be useable.

Ceasing these permits altogether would result in adverse economic effects on these permit holders. Ceasing abstraction from Take 17 would result in very little gain to flows in the Lindis River, given the lack of connectivity with the Lindis main-stem as described in Section 10.4 and Appendix D.

10.17 Summary

Many of the values associated with the Lindis catchment are inherently interlinked in terms of the likely effects of this application.

The current regime of abstraction has resulted in a catchment with extended periods of low-flows during the irrigation season, and large lengths of the lower 25km of the Lindis River going dry, and disconnected surface flows with the Clutha River.

Notwithstanding this, a range of values are identified for the Lindis River, including:

- major spawning and juvenile trout rearing stream that is important for juvenile trout recruitment to the nationally important Clutha River system and Lake Dunstan fisheries
- trout fishing
- moderate levels of natural character
- camping, picnicking
- culturally significant

The catchment has previously been identified as culturally significant from a mahika kai perspective, however galaxiid populations are very limited and are primarily confined to the upper reaches of a few tributaries. Eel have a very limited abundance within the catchment. Predation by trout and the impact of the dams on the Clutha River are likely to be major factors in limiting these populations, with abstraction taking a lesser role.

These values will all be enhanced and provided for by this proposal. The extent and duration of low flows will be significantly reduced, and connectivity with the Clutha River will be maintained through the implementation of a minimum flow. The life-sustaining capacity of the Lindis catchment will be maintained and improved for a wide range of ecological values. Habitat values for trout will be improved throughout the main-stem, with particular gains in the reach above the Ardgour Bridge due to the disestablishment of the main race intakes.

Habitat for galaxiids will be maintained in the limited areas where sustainable populations of this species is present, however, on-going, active management will be required to ensure these populations are protected from trout. Further enhancement of these populations is possible if this active management occurs. Passage past the dams on the Clutha River will need to be created before eel populations return naturally to this catchment.

Replacing these permits will enable farming businesses to continue to remain viable. A minimum flow of 550 l/s will result in adverse economic and social effects on the catchment. However the applicants accept that some economic loss is necessary to ensure the life-supporting capacity of the Lindis catchment is provided for and enhanced. With effective farm management and efficient use of this water, these farming businesses feel they will be able to accept the economic effects that will result from the implementation of a minimum flow of 550 l/s.

If these permits were not replaced natural flow characteristics would return to the catchment. This would result in further improvements to trout habitat, and recreational fishing. It is unlikely to result in improvements to populations of galaxiids or eels. Benefits to other recreational values such as camping and picnicking may not be readily discernible beyond the benefits likely to result from this proposal. Cultural values associated with restoration of natural flow characteristics including the Mauri of the Lindis would also be enhanced. However other cultural values would still be affected by other factors such as limitations on access due to landownership, trout predation on native fish species and lack of passage past dams on the Clutha.

Not replacing these permits would result in very significant adverse economic and social effects on the applicants and the local community, with flow on effects for the region. Many of these farms would no longer be economically viable.

Overall, granting this application as proposed will lead to adverse economic effects. The applicants have indicated that they can accept these adverse effects and will be able to remain viable farming businesses. This proposal will result in significant enhancement to the current in-stream ecological values and natural character, and will sustain a healthy eco-system and life-supporting capacity within the catchment. It will also result in the enhancement of cultural values, amenity values and recreational values.

The proposal put forward by the applicant includes a range of measures, including a minimum flow, residual flows, reduction in allocation and disestablishment of large race intakes. These measures aim to maximise the potential for positive effects on the values associated with the River, while also minimising the adverse economic and social effects that will result from a decrease in reliability of supply caused by the minimum flow.

11. Part Two Assessment

11.1 Part Two

Schedule 4(2)(f) requires an application for a resource consent to include an assessment of the activity against the matters set out in Part 2 of the RMA.

Based on the assessment of this application against the relevant provisions of planning documents in s1041(a) and the AEE as required by s104(1)(a), this application is considered to be consistent with Part 2 of the RMA:

- It will sustain the potential of the Lindis River and tributaries to meet the reasonably foreseeable needs of future generations (including needs associated with productive agricultural land use)
- It will safeguard the life-supporting capacity of the Lindis River and tributaries, by ensuring sufficient flow is retained in these waterways, with regard to the impact of abstraction
- Adverse effects associated with drying up of the lower reach of the Lindis River will be avoided, as will the adverse effects caused by the large race intakes, and loss of water from the existing race system. Significant adverse economic effects on economic and social well-being will also be avoided by granting these replacement permits as sought
- A range of effects will be remedied or mitigated, including effects on trout habitat, natural character, amenity values, and recreational and cultural values. A more detailed overview of mitigation measures is provided below.
- The relationship of Kai Tahu with the Lindis catchment has been recognised and provided for, as has kaitiakitanga, through enhancements to the Mauri and ecology of the Lindis catchment, particularly by ensuring connectivity with the Clutha River.
- Water will be used efficiently
- Trout habitat is being protected
- Amenity values will be maintained and enhanced
- The intrinsic value of the ecosystem in the Lindis River and its tributaries has been recognised and provided for
- The quality of the environment is being maintained and enhanced.

11.2 Mitigation Measures

Schedule 4 6(1)(e) requires a description of mitigation measures proposed by this application. This is also relevant under section 5, Part 2 of the RMA. Mitigation measures include:

a) A catchment based approach to water management. By working together the permit holders represented by the applicant have been able to develop a cohesive approach to managing abstraction that will mitigate effects on flows and related values in the catchment, whilst also minimising economic and social effects on their community.

b) Implementation of a minimum flow on all takes within the Lindis catchment (except for Take 17)
c) Implementation of residual flows for takes from tributaries where they would not go dry naturally below the point of take
d) Efficient methods of irrigation – 1,600 ha of spray irrigation is currently in place within the Lindis catchment, about 1,000 ha of which is pivots. The majority of the remaining 900 ha of the irrigated area within the catchment will be able to be converted to efficient spray irrigation if a minimum flow of 550 L/sec is implemented.
e) Development of existing on farm storage. Options for development of further storage are limited in the catchment but significant investigations into this have been carried out, as referred to in Section 1.
f) Reduction in allocation, including total annual volume and instantaneous rate of take (reduction from consented and actual volume and rate currently abstracted)
g) Disestablishment of large race intakes and races – this reduces inefficiency from water losses along the races, and avoids the significant de-watering that occurs from large amounts of water being abstracted at a few sites.
h) Replacement of race intakes with a number of shallow bores with smaller allocations – this effectively diffuses the impacts of taking water – both by taking sub-surface flows and smaller amounts from more intake sites
i) Flow pulse – this mitigates effects on fish passage by providing a flush of water during periods of lower flows.
j) All of the measures above mitigate the adverse economic and social on water users that result from reduced reliability of supply if a higher minimum flow than 550 L/sec were imposed.

12. Consultation with Affected Parties

This consent application has been developed as part of the minimum flow setting process undertaken for the Lindis catchment. As such it draws from and is based on the extensive consultation, discussions and negotiations that have taken place with a very broad range of affected parties involved in the plan change process over many years.

The range of parties involved in the minimum flow plan change are far more extensive than those usually considered by the Otago Regional Council to be an affected party to the replacement of existing water permits (including deemed permits). Iwi, the Department of Conservation and Fish and Game Otago are generally considered to be affected parties to applications such as this. These parties have all been involved throughout this process.

Consultation and work with these parties has included:

- Many meetings and ongoing correspondence with all these parties relating to water management in the Lindis over the last 3 to 4 years.
- A series of think tanks primarily involving the applicant, Fish and Game and Clutha Fisheries Trust (the ORC, DOC and iwi were also invited to participate) prior to the notification of the Plan Change 5A. These raised the concept of the gallery project and the benefits that would result from this.
- Site visits with Kai Tahu ki Otago representatives to tributaries during the Think Tank process in 2015 and more recently in 2017
- Facilitation of flow manipulation to enable a cultural assessment to be undertaken by iwi representatives in February and April of 2017
- Facilitation of flow manipulation to enable further assessment work by Fish and Game representatives to take place February and April of 2017

The only water user who is not part of LCG is Oak Tree Ltd. This company has already applied separately to the ORC to replace its deemed permit. Oak Tree Ltd has been invited to be part of LCG but has not taken up this offer to date.

The knowledge and views gained from consultation and engagement with key stakeholders and affected parties has helped shape or inform the development of this proposal. Input from these stakeholders has also been integrated into the assessment within this application document.

13. Draft Consent Conditions

This section contains the consents sought as part of this application. The 'front end' of individual consents to take and use water are outlined separately first. This includes details such as location and maximum rates and volumes of abstractions, residual flows and minimum flows.

To avoid repetition the general conditions that would apply to all consents are contained in a single section at the end of section detailing each type of consent.

Note that references to tables in this section are references only to the tables within the same draft consent document.

13.1 Consent to Construct Bores

13.1.1 Lindis Irrigation Company

Name: Lindis Irrigation Company

Address: 135 Morris Road, RD2, Wanaka 9382

To construct bores for the purpose of accessing groundwater (connected to surface water)

For a term of 5 years

Take Point replacing Tarras Race after 5 years	**Location of Point of Abstraction:** **All within the Lindis Ribbon Aquifer** **(MRAPA = Map Reference at Point of Abstraction)**	**Map Reference at Point of Abstraction (MRAPA):** **(NZTM200)**	**Legal Description of land at point of abstraction:**
Take T1	Within 400m upstream or downstream of the MRAPA within Cluden Station land on the Lindis River.	1323597 5031025	SEC 3 SO 463650
Take T2a	Along the Lindis River boundary of Pukemara property within 400m either side of MRAPA	1317900 5025815	SEC 6 BLK XV TARRAS SD
Take T4	100 metres to the south east of	1312808	LOT 1 DP 426163

	SH8, to a point located 360m north of the intersection of SH8 and Maori Point Road	5024716	
Take T5	Between the MRAPA points 50 metres back from the property boundary adjacent to SH8	Between 1314186 5026239 and 1313605 5025668	Lot 2 Deposited Plan 487514

[note T3 is not included as will be a surface water take]

Take Points replacing Ardgour Race after 5 years	**Location of Point of Abstraction:** **All within the Lindis Ribbon Aquifer** **(MRAPA = Map Reference at Point of Abstraction)**	**Map Reference at Point of Abstraction (MRAPA):** **(NZTM200)**	**Legal Description of land at point of abstraction:**	**Legal Description of land where water will be used:**
Take A1	Within a 300m radius of the MRAPA	1318512 5025586	LOT 4 DP 392523	LOT 4 DP 392523
Take A2	At this existing take point for 2007.497 or away from the river further. Within a 400m radius of this existing point (see MRAPA)	1317752 5024986	LOT 1 DP 450337 LOT 4 DP 450337	LOT 1 DP 450337 LOT 4 DP 450337
Take A3	Within a 400m radius of MRAPA on land owned by the McElraes	1318235 5025414	Lot 1 DP375322	Lot 1 DP375322
Take A4	Within a 500m radius of MRAPA	1316889 5024395	Lot 2 DP 342832	LOT 2 DP 392523, LOT 1 DP 375322, LOT 3 DP 392523, Lot 1, Lot 2, Lot 4

				DP 342832, Lot 2 DP 432876, Lot 2 DP 410980 and Lot 5 DP 432876, Lot 1 DP 432876, Lot 1 DP 300185, Lot 2 DP 432876, Sec 34 Block XVI Tarras SD, Sec 35 Block XVI Tarras SD
Take A6a	Within the Dry Creek area 400m from the MRAPA	1316457 5023599	Lot 1 DP 25202 and Section 50 Block XVI Tarras SD	Lindisvale Trevathan: LOT 1 DP 25202, PT SEC 25 BLK XVI TARRAS SD, SEC 24 BLK XVI TARRAS SD, SEC 50 BLK XVI TARRAS SD Ardgour Station: LOT 2 DP 509332
Take A7	Within a stretch between the NZTM200 points	Between 1314453 5022881 and 1314921 5023127	Lot 2 DP 300805 or Lot 4 DP 300395	Lot 2 DP 300805, Lot 4 DP 300395
Take A8	Within a 300m radius	1316094 5023608	SEC 49 BLK XVI TARRAS SD	SEC 49 BLK XVI TARRAS SD
Take A9	Within a 400 m radius of the MRAPA	1323597 5031025	Lot 2, 5 Deposited Plan 450337	LOT 2 DP 450337

[note that a consent to construct a bore is not sought for A5, as this bore already exists]

13.1.2 Rutherford Family, The Point

Name: Alastair Askin Rutherford, Suzanne Elizabeth Rutherford

Address: The Point, RD3, Cromwell

To construct bores for the purpose of accessing groundwater

Location of consent activity:	Within a 200 metre radius of the GPS location below within the Lindis Ribbon Alluvial Aquifer
Legal description of consent location:	Run 236U, Block IX, Cluden SD.
GPS location of consent activity:	NZTM2000 1320958 5028548

For a term of 5 years

13.1.3 Conditions that would apply to all consents to construct a bore

Specific

1. If this consent is not given effect to within a period of two years from the date of commencement of this consent, this consent shall lapse under Section 125 of the Resource Management Act 1991. The consent shall attach to the land to which it relates.

2. All bores constructed under this consent shall be located more than 50 m away from a property boundary, unless written approval is obtained from the neighbouring property owner concerned and this is supplied to the consent authority in writing prior to constructing the bore.

3. All bores will be sited to so that they cause acceptable interference on neighbouring bores, as assessed by a suitably qualified hydrogeologist. The assessment of the hydrogeologist shall be provided in writing to the consent authority.

4. Any bore tag provided to the consent holder by the Consent Authority must be attached to the bore within two weeks of completion of the bore construction. The consent holder shall ensure the bore tag is attached to the bore and in good condition at all times.

5. Work carried out during the construction of the bore shall be to the New Zealand Standard "Environmental Standard for Drilling of Soil and Rock" NZS 4411:2001.

6. There shall be adequate facility and access for future vertical lowering of a 20 millimetre diameter electric plumb bob for the purpose of measuring water level, or a facility which allows pressure readings.

7. There shall be adequate facility and access for future water quality sampling such as a hand operated tap/valve that is sourced from the direct pump outlet, before the reticulation encounters pressure tanks/reservoir/treatment plant. Where there is reticulation back pressure at the bore head, a one way valve shall be fitted for maximum efficiency and in that case, the water sampling point shall be on the bore pump side of the one way valve.

8. Copies of the results of any water quality analyses performed on the groundwater shall be forwarded to the Consent Authority within two weeks of the analysis being undertaken.

Performance Monitoring

9. Within two weeks after completion of the bore construction, the consent holder shall forward the following information to the Consent Authority:
    a. A fully completed bore log form and
    b. Copies of the results of any pumping tests carried out.

General

10. The bore head casing and reticulation shall be suitably constructed and sealed to avoid ingress of surface water and other foreign matter.

11. This consent only authorises the construction of one production bore. The bore integrity shall be maintained at all times unless abandoned. If the bore is abandoned, or any drill holes not required, the bore shall be appropriately sealed/grouted and backfilled, and any drill holes not required shall be backfilled, to prevent contaminants from entering the bore or drill hole at any level.

13.2 Permits to Take and Use Water

13.2.1 Emmerson Family, Forest Range

Take 1 (Consent 96196) and Take 2 (Consent 99298) - Supplementary Take

Name: R J & S Emmerson and Trust

Address: PO Box 9, Tarras 9347

To take and use surface water from Station Creek and McKenzies Creek, tributaries of the Lindis River, for the purpose of irrigation, storage and hydro-electricity generation.

For a term expiring: *[35 years from commencement of consent*

Location Details	**Take 1**	**Take 2**
Location of Point of Abstraction:	Forest Range Station, Station Creek	Forest Range Station, Station Creek
Map Reference at Point of Abstraction (NZTM2000):	1322636E 5051007N	1321137E 5048805N
Legal Description of land at point of abstraction:	Part Run 236B, Block IX, Lindis Survey District.	Part Run 236B, Block V Lindis Survey District.
Legal Description of land where water will be used:	Run 236B	Run 236B

1. The rate and volume of abstraction must not exceed:
    a. 100 litres per second from Station Creek
    b. 55 litres per second from McKenzies Creek
    c. 810,000m³ from Take 1 and Take 2 combined, during the period from 1 July in one year to 30 June in the following year.

2. Other than exercising this permit for reasonable domestic and stock drinking water purposes a residual flow of no less than
    a. 20 litres per second shall be maintained in Station Creek immediately downstream of Take Point 1.
    b. 15 litres per second shall be maintained in McKenzies Creek immediately downstream of Take Point 2.

3. Other than exercising this permit for reasonable domestic and stock drinking water purposes, no abstraction shall occur from the Take Points 1 or 2 when flows in the Lindis River are equal to or less than 1600 litres per second at the Otago Regional Council's Ardgour Road flow monitoring site.

13.2.2 McCaughan Family, Geordie Hill Station

Take 3 (96638.v2) and 4 (96637.v2)

Name: 13/14th Geordie Hill Station Limited

Address: c/- Ibbotson Cooney Limited, Chartered Accountants, Level 1, 69 Tarbert Street, Alexandra

Name: 1/14th Matthew and Joanne McCaughan

Address: Geordie Hill Station, Goodger Road, RD 3, Tarras

To take and use surface water from an unnamed tributary of Long Spur Creek, known locally as Little Rocky Hill Creek or Short Spur, for the purpose of irrigation, storage and hydro-electricity generation.

For a term expiring: *[35 years from commencement of consent*

Location Details	**Take 3**	**Take 4**
Location of Point of Abstraction:	An unnamed tributary of Long Spur Creek, known locally as Little Rocky Hill Creek or Short Spur, approximately 2.5 kilometres northeast of the intersection of Lindis Pass-Tarras Road and Goodger Road, Lindis Valley.	Long Spur Creek, approximately 3.3. kilometres northeast of the intersection of Lindis Pass – Tarras Road and Goodger Road, Lindis Valley.
Map Reference at Point of Abstraction (NZTM 2000):	1324741E 5045805N	1325742E 5045806N
Legal Description of land at point of abstraction:	Secs 2,3,4, Pt Secs 4,6, SO 354548, Sec 1-2 SO 374088	Secs 2,3,5, Pt Secs 4,6 SO 354548, Secs 1-2 SO 374088
Legal Description of land where water will be used:	Secs 2,3,4, Pt Secs 4,6, SO 354548, Sec 1-2 SO 374088	Secs 2,3,5, Pt Secs 4,6 SO 354548, Secs 1-2 SO 374088

1. The rate of abstraction must not exceed
    a. 111 litres per second from Take 3 and Take 4 combined
    b. 1,215,000m³ from Take 3 and Take 4 combined, during the period from 1 July in one year to 30 June in the following year.

2. From *[5 years after the date of issue of this consent],* no abstraction shall occur from the Take Points 3 and 4 when flows in the Lindis River are equal to or less than 550 litres per second at the Otago Regional Council's Ardgour Road flow monitoring site, other than exercising this permit for reasonable domestic and stock drinking water purposes.

13.2.3 Davis Family, Longacre Station

Take 5a (99062.V1 and 99328.V1) and 5b (2008.361.V1), Take Point 6 (97059.v2) and Take Point 7 (96007.v1)

Name: Longacre Station Ltd

Address: Level 1, 69 Tarbert Street, Alexandra

To take and use surface water from the Lindis River, Timburn Creek, Cluden and Coal Creek, for the purpose of irrigation, storage and hydro-electricity generation.

For a term expiring: *[35 years from commencement of consent*

Location Details	**Take 5a, b**	**Take 6**	**Take 7a**
Location of Point of Abstraction:	Lindis River, adjacent to State highway 8. approximately 700 metres upstream of Elliots Bridge	True Right bank of Tim Burn, approximately 2 kilometres upstream of the confluence with the Lindis River.	Cluden Creek and Coal Creek, approximately 15 kilometres upstream of the confluence with the Lindis River.
Map Reference at Point of Abstraction (NZTMA 2000):	1323545E 5039400N	1326351E 5039359N OR 1326816E 5039748N	Cluden: 1336954E 5037709N Discharge from Coal Creek: 1335853E 5038408N Re-taking from Coal Creek: 1327548E 5038202N
Legal Description of land at point of abstraction:	Reserve adjacent to Run 676 Block II Cluden SD.	Sec 18 SO 354550	Run 237F, Sec 2 SO 354550, Sec 16 SO 354550
Legal Description of land where water will be used:	Sec 15-22 SO 354550	Sec 15-22 SO 354550	Sec 15-22 SO 354550

1. The rate of abstraction must not exceed:
    a. A combined total of 151 litres per second from Take 5a and Take 6, but the rate of abstraction from Take 6 must not exceed 28 litres per second *[note that this 5a combines old 5a and 5b]*
    b. 56 litres per second from Take 5b *[note that this 5 b represents old 5c – supplementary take]*
    c. 7 litres per second from Take 7a
    d. 2,323,187 m³ from Take 5a, 6 and 7a combined, during the period from 1 July in one year to 30 June in the following year.
    e. 866,700 m³ from Take 5b, during the period from 1 July in one year to 30 June in the following year.

2. The combined total abstraction from Take 5a under this consent and Take 5c under Consent *[insert consent number for Timburn Ltd for Take 5c]* must not exceed:
    a. 252 litres per second
    b. 4,681,800 m³ during the period from 1 July in one year to 30 June in the following year.

3. Other than exercising this permit for reasonable domestic and stock drinking water purposes a residual flow of no less than 5 litres per second shall be maintained in Cluden Creek immediately downstream of Take 7a.

4. From *[5 years after the date of issue of this consent],* no abstraction shall occur from the Take Points 5a, 6 and 7 when flows in the Lindis River are equal to or less than 550 litres per second at the Otago Regional Council's Ardgour Road flow monitoring site, other than exercising this permit for reasonable domestic and stock drinking water purposes.

5. Other than exercising this permit for reasonable domestic and stock drinking water purposes, no abstraction shall occur from the Take Point 5b when flows in the Lindis River are equal to or less than 1,600 l/s at the Otago Regional Council's Ardgour Road flow monitoring site.

13.2.4 Lucas Family, Timburn Station

Take 5c (Consents 99022.v1, 99329.v1) and Take 7b (Consent 99021.v1)

Name: Timburn Ltd

Address: Level 5, 229 Moray Place, DunedinCentral, Dunedin 9016

To take and use surface water from the Lindis River, Cluden and Coal Creek, for the purpose of irrigation and storage.

For a term expiring: *[35 years from commencement of consent]*

Location Details	**Take 5c** *[formerly 5d and 5e]*	**Take 7b**
Location of Point of Abstraction:	Lindis River, adjacent to State highway 8. approximately 700 metres upstream of Elliots Bridge	Cluden Creek and Coal Creek, approximately 15 kilometres upstream of the confluence with the Lindis River.
Map Reference at Point of Abstraction (NZTM 2000):	1323545E 5039400N	Cluden: 1336954E 5037709N Discharge from Coal Creek: 1335853E 5038408N Re-taking from Coal Creek: 1327548E 5038202N
Legal Description of land at point of abstraction:	Reserve adjacent to Run 676 Block II Cluden SD.	Run 237F, Sec 2 SO 354550, Sec 16 SO 354550
Legal Description of land where water will be used:	Sec 3,4,5 SO 354550	Sec 3,4,5 SO 354550

1. The rate of abstraction must not exceed:
    a. 101 litres per second from Take 5c *[note that this 5c is the old 5d and e]*
    b. 77 litres per second from Take 7b
    c. 2,227,500 m³ from Take 5c and 7b combined, during the period from 1 July in one year to 30 June in the following year.

2. The combined total abstraction from Take 5c under this consent and Take 5a under Consent *[insert consent number of Longacre Station Take 5a]* must not exceed:
    a. 252 litres per second
    b. 4,681,800 m³ during the period from 1 July in one year to 30 June in the following year.

3. Other than exercising this permit for reasonable domestic and stock drinking water purposes a residual flow of no less than 5 litres per second shall be maintained in Cluden Creek immediately downstream of Take 7.

4. From *[5 years after the date of issue of this consent],* no abstraction shall occur from the Take Points 5c and 7b when flows in the Lindis River are equal to or less than 550 litres per second at the Otago Regional Council's Ardgour Road flow monitoring site, other than exercising this permit for reasonable domestic and stock drinking water purposes.

13.2.5 LIC Consents with Minimum Flow of 550 l/s

Take 11 (Consent 2001.807v2 Tarras Race) and Take 12 (Consent 2001.809v1 Ardgour Race), Take 31a and b (Consents 2003.110,)

Name: Lindis Irrigation Company

Address: 135 Morris Road, RD2, Wanaka 9382

To take, convey and use surface water from the Lindis River (including connected groundwater) and an unnamed tributary of the Clutha River (known locally as Cluden Swamp)

For a term expiring: *[35 years from commencement of consent, except for Take 31a and 31b which have a term of 5 years from commencement of consent]*

Conditions relating to location of takes:

1. Until 5 years after the issue of this consent water shall be taken under this consent in the following locations:

Table 1

Take Points within first 5 years	**Location of Point of Abstraction**	**Reference at Point of Abstraction (NZTM2000):**	**Legal Description of land at point of abstraction:**	**Legal Description of land where water will be used:**
Take 11:	At the Ardgour main race intake which is on the true left bank of the Lindis River at the upstream end of Archies Flat.	1323951E 5030895N	Run 237F SO1192	LOT 4 DP 392523 LOT 1 DP 450337, LOT 4 DP 450337 Plus McElrae LOT 2 DP 392523, LOT 1 DP 375322, LOT 3 DP 392523 SEC 51 BLK XVI TARRAS SD Lindisvale Trevathan: LOT 1 DP 25202, PT SEC 25 BLK XVI TARRAS SD,

Take Points within first 5 years	Location of Point of Abstraction	Reference at Point of Abstraction (NZTM2000):	Legal Description of land at point of abstraction:	Legal Description of land where water will be used:
				SEC 24 BLK XVI TARRAS SD, SEC 50 BLK XVI TARRAS SD Ardgour Station: LOT 2 DP 509332 LOT 4 DP 300395, LOT 2 DP 300805, LOT 8 DP 300395 SEC 49 BLK XVI TARRAS SD LOT 2 DP 450337 and other land as shown on LIC command area map
Take T1, T2a, T3a, T4	See Table 2 below	See Table 2 below	See Table 2 below	See Table 2 below
Take 12	From the true right bank of the Lindis at a point approximately 150 metres upstream of the confluence of Cluden stream and the Lindis River. Tarras main race	1324150E 5032696N	Run 237F	SEC 3 SO 463650 Plus Crown Land LOT 3 DP 483646, LOT 4 DP 483646, LOT 1 DP 483646, Plus Crown land SEC 6 BLK XV TARRAS SD LOT 1 DP 426163
Take A1, A2, A3, A4, A5, A6a, A8,A9	See Table 3 below	See Table 3 below	See Table 3 below	See Table 3 below
31a	Cluden swamp on the east side of Munro Lane,	1316547E 5029689N	Pt Lot 5 DP3510 Blk I	Lot 2 Deposited Plan 475124 and Lot 1 Deposited Plan 425892

Take Points within first 5 years	Location of Point of Abstraction	Reference at Point of Abstraction (NZTM2000):	Legal Description of land at point of abstraction:	Legal Description of land where water will be used:
	Tarras. retake		Tarras SD	

[see Hayman/Pukemara Partnership Ltd consent for Take T2b and Bruce and Lindis Jolly consent for A6b]

2. After five years from the issue of this consent, water shall be taken under this consent from the Take Points in Table 2.

Table 2

Take Point replacing Tarras Race after 5 years	Location of Point of Abstraction: All within the Lindis Ribbon Aquifer (MRAPA = Map Reference at Point of Abstraction)	Map Reference at Point of Abstraction (MRAPA): (NZTM200)	Legal Description of land at point of abstraction:	Legal Description of land where water will be used:
Take T1	Within 400m upstream or downstream of the MRAPA within Cluden Station land on the Lindis River.	1323597 5031025	SEC 3 SO 463650	SEC 3 SO 463650 Plus Crown Land
Take T2a	Along the Lindis River boundary of Pukemara property within 400m either side of MRAPA	1317900 5025815	SEC 6 BLK XV TARRAS SD	SEC 6 BLK XV TARRAS SD
Take T3a	At Take 15 current point of take or within 200m downstream	1320578 5029181	Lot 2-3 DP 483646	LOT 3 DP 483646, LOT 4 DP 483646, LOT 1 DP 483646, Plus Crown land

Take Point replacing Tarras Race after 5 years	Location of Point of Abstraction: All within the Lindis Ribbon Aquifer (MRAPA = Map Reference at Point of Abstraction)	Map Reference at Point of Abstraction (MRAPA): (NZTM200)	Legal Description of land at point of abstraction:	Legal Description of land where water will be used:
Take T4	100 metres to the south east of SH8, to a point located 360m north of the intersection of SH8 and Maori Point Road	1312808 5024716	LOT 1 DP 426163	LOT 1 DP 426163

3. After *[insert date 5 years after commencement of this consent]*, water shall be taken under this consent from the Take Points in Table 3.

Table 3

Take Points replacing Ardgour Race after 5 years	Location of Point of Abstraction: All within the Lindis Ribbon Aquifer (MRAPA = Map Reference at Point of Abstraction)	Map Reference at Point of Abstraction (MRAPA): (NZTM200)	Legal Description of land at point of abstraction:	Legal Description of land where water will be used:
Take A1	Within a 300m radius of the MRAPA	1318512 5025586	LOT 4 DP 392523	LOT 4 DP 392523
Take A2	Within a 400m radius of this existing point (see MRAPA)	1317752 5024986	LOT 1 DP 450337 LOT 4 DP 450337	LOT 1 DP 450337 LOT 4 DP 450337
Take A3	Within a 400m radius of MRAPA on land owned by the McElraes	1318235 5025414	Lot 1 DP375322	Lot 1 DP375322
Take A4	Within a 500m radius of MRAPA	1316889	Lot 2 DP 342832	LOT 2 DP 392523, LOT 1 DP 375322,

Take Points replacing Ardgour Race after 5 years	Location of Point of Abstraction: All within the Lindis Ribbon Aquifer (MRAPA = Map Reference at Point of Abstraction)	Map Reference at Point of Abstraction (MRAPA): (NZTM200)	Legal Description of land at point of abstraction:	Legal Description of land where water will be used:
		5024395		LOT 3 DP 392523, Lot 1, Lot 2, Lot 4 DP 342832, Lot 1, 2 and Lot 5 DP 432876, Lot 2 DP 410980, Lot 1 DP 300185, Lot 2 DP 432876, Sec 34 Block XVI Tarras SD, Sec 35 Block XVI Tarras SD
Take A5	Within 300m radius of the MRAPA	1316610 5023990	SEC 51 BLK XVI TARRAS SD	SEC 51 BLK XVI TARRAS SD
Take A6a	Within the Dry Creek area 400m from the MRAPA	1316457 5023599	Lot 1 DP 25202 and Section 50 Block XVI Tarras SD	Lindisvale Trevathan: LOT 1 DP 25202, PT SEC 25 BLK XVI TARRAS SD, SEC 24 BLK XVI TARRAS SD, SEC 50 BLK XVI TARRAS SD Ardgour Station: LOT 2 DP 509332
Take A7	Within a stretch between the NZTM200 points	Between 1314453 5022881 and 1314921 5023127	Lot 2 DP 300805 or Lot 4 DP 300395	Lot 2 DP 300805, Lot 4 DP 300395

Take Points replacing Ardgour Race after 5 years	Location of Point of Abstraction: All within the Lindis Ribbon Aquifer (MRAPA = Map Reference at Point of Abstraction)	Map Reference at Point of Abstraction (MRAPA): (NZTM200)	Legal Description of land at point of abstraction:	Legal Description of land where water will be used:
Take A8	Within 300m radius of the MRAPA	1316094 5023608	SEC 49 BLK XVI TARRAS SD	SEC 49 BLK XVI TARRAS SD
Take A9	Within a 400 m radius of the MRAPA	1323597 5031025	Lot 2, 5 Deposited Plan 450337	LOT 2, 5 DP 450337

4. Once the location of any of the Takes in Table 2 and 3 are identified and confirmed the consent holder must notify the consent authority of the final, specific location of that take including a description of the location, map reference and legal description of the point of take within 31 days.

5. Until and including *[5 years from the date of issue of this consent]* the rate of abstraction must not exceed:
    a. 1120 litres per second as a combined total from Takes 11, T1, T2a, T3a, T4
    b. 600 litres per second as a combined total from Takes 12, A1, A2, A3, A4, A5, A6a, A7, A8 and A9
    c. 555.5 litres per second from Take 31a
    d. 13,770,000 m^3 as a combined total during the period from 1 July in one year to 30 June in the following year from Takes 11, T1, T2a, T3a, T4
    e. 6,480,000 m^3 as a combined total during the period from 1 July in one year to 30 June in the following year from Takes 12, A1, A2, A3, A4, A5, A6a, A7, A8 and A9

6. From *[5 years after the date of issue of this consent]* the rate of abstraction must not exceed:
    a. 96 litres per second as a combined total from Takes T1, T2a, T3a, T4, except that the combined total rate of abstraction from T4 and RM14.164.01 shall not exceed 90 L/sec.
    b. 1,710,720m^3 during the period from 1 July in one year to 30 June in the following year from Takes T1, T2a, T3a, T4

7. From *[5 years after the date of issue of this consent]* the rate of abstraction must not exceed:
    a. 284 litres per second as a combined total from Takes A1, A2, A3, A4, A5, A6a, A7 A8 and A9
    b. 4,469,601 m^3 as a combined total during the period from 1 July in one year to 30 June in the following year from Takes A1, A2, A3, A4, A5, A6a, A7, A8 and A9

5. From *[5 years after the date of issue of this consent]* no abstraction shall occur from the Take Points in Table 2 and 3 when flows in the Lindis River are equal to or less than 550 litres per second at the Otago Regional Council's Ardgour Road flow monitoring site, other than exercising this permit for reasonable domestic and stock drinking water purposes.

6. The consent holder shall fit a back flow preventer device to T1, T2a, T3a, T4, A1, A2, A3, A4, A5, A6, A7, A8 and A9, to prevent contaminants from being drawn into the source of the water.

13.2.6 Purvis Family, Cluden Station

Take point 31 b Consent (2006.254.v1) Take point 31c (Consent 2003.251.v1–)

Name: Cluden Station Ltd

Address: Level 1, 69 Tarbert Street, Alexandra 9320, New Zealand

To take and use surface water from an unnamed tributary of the Clutha River known locally as Cluden Swamp for the purpose of irrigation.

For a term expiring: *[35 years from commencement of consent*

Location Details	**Take point 31b and c**
Location of Point of Abstraction:	Unnamed tributary (known locally as Cluden Swamp) of the Clutha River
Map Reference at Point of Abstraction (NZTM 2000):	1316547E 5029689N
Legal Description of land at point of abstraction:	**31b:** Pt Lot 5 DP 3510 Blk I Tarras SD **31c:** Lot 1 DP425892
Legal Description of land where water will be used:	Lot 2 DP 475124 and Lot 1 DP 425892

1. The rate of abstraction must not exceed:
    a. 36 litres per second from Take 31b and c
    b. 567,000 m³ during the period from 1 July in one year to 30 June in the following year from Take 31b and c

13.2.7 Rutherford Family, The Point

Take points 13 (Consents 96066) and 14 (Consent 96967v2)

Name: Alastair Askin Rutherford, Suzanne Elizabeth Rutherford

Address: The Point, RD3, Cromwell

To take and use groundwater connected to surface water from the Lindis River and surface water from the Waiwera Creek for the purpose of irrigation, storage and hydro-electricity generation.

For a term expiring: *[35 years from commencement of consent*

Location Details	**Take point R13 (groundwater connected to surface water)**	**Take 14a and b**
Location of Point of Abstraction:	Lindis River, approximately 2.4 kilometres northeast of the intersection of Ardgour road and Lethbridge Road, at the north end of Ardgour Valley, Lindis.	From Waiwera creek at a point 3.5 kilometres upstream of the Confluence of Waiwera Creek, and the Lindis River.
Map Reference at Point of Abstraction (NZTM 2000):	1320958 5028548	NZMS 260 G41: 291 – 879, and G41: 326 – 867
Legal Description of land at point of abstraction:	Run 236U, Block IX, Cluden SD.	Part Section 3, Block VX, Tarras Survey District; and run 236U Block XIII Cluden Survey District.
Legal Description of land where water will be used:	PT SEC 3 BLK XV TARRAS SD SEC 2 BLK IX CLUDEN SD, RUN 236U	

1. The rate of abstraction must not exceed:
    a. 295 litres per second from Take R13
    b. 42 litres per second as Take 14a *[primary allocation]*

c. 120 litres per second as Take 14b *[supplementary allocation]*
d. 4,090,500m³ as a combined total during the period from 1 July in one year to 30 June in the following year from Take R13 and Take 14a and b

2. Other than exercising this permit for reasonable domestic and stock drinking water purposes a residual flow must be maintained that provides visible surface flow in Waiwera Creek for approximately 100 metres below the point of take.

3. From *[5 years after the date of issue of this consent]* no abstraction shall occur from the Take R13 and 14a when flows in the Lindis River are equal to or less than 550 litres per second at the Otago Regional Council's Ardgour Road flow monitoring site, other than exercising this permit for reasonable domestic and stock drinking water purposes.

4. Abstraction shall occur for Take 14b when flows in the Lindis River are equal to or less than 1600 litres per second at the Otago Regional Council's Ardgour Road flow monitoring site.

5. The consent holder shall fit a back flow preventer device to R13 to prevent contaminants from being drawn into the source of the water.

13.2.8 Jolly Family, Kotiti

Take point 32 (Consents 2001.546v1)

Name: Jolly Family Trust

Address:

To take and use surface water from the Lindis River and a spring near Jolly Road, Tarras for the purpose of irrigation and storage.

For a term expiring: *[35 years from commencement of consent*

Location Details	**Take point 32**
Location of Point of Abstraction:	Springs east of Jolly Rd Tarras
Map Reference at Point of Abstraction (NZTM 2000):	1315947E 5029788N
Legal Description of land at point of abstraction:	Pt Lot 6 DP 3510
Legal Description of land where water will be used:	PT LOT 6 DP 3510

1. The rate of abstraction must not exceed:
    a. 26 litres per second from Take 32
    b. 299,700 m³ during the period from 1 July in one year to 30 June in the following year from Take 32
2. Other than exercising this permit for reasonable domestic and stock drinking water purposes a residual flow must be maintained that provides visible surface flow in the Spring immediately below Take Point 32.

13.2.9 James and Angela Smith

Take point 15 (Consent 2001.544.v1 currently owned by Peter Jolly) and Take T3b (supplementary)

Name: Tarras Properties Ltd

Address: *to be supplied to ORC*

To take and use surface water from the Lindis River.

For a term expiring: *[35 years from commencement of consent*

Location Details	**Take point 15**	**Take T3b**
Location of Point of Abstraction:	True right bank of the Lindis River, approximately 3 kilometres west of Tarras township, Central Otago.	At Take 15 current point of take or within 200m downstream
Map Reference at Point of Abstraction (NZTM 2000):	1320350E 5029091N	1320578 5029181
Legal Description of land at point of abstraction:	Adjacent to Sec 15 Blk XV Tarras SD.	Lot 2-3 DP 483646
Legal Description of land where water will be used:	LOT 3 DP 483646	LOT 3 DP 483646, LOT 4 DP 483646, LOT 1 DP 483646, Plus Crown land

1. The rate of abstraction must not exceed:
    a. 80 litres per second from Take 15
    b. 50 litres per second from Take T3b
    c. 1,053,000 m³ during the period from 1 July in one year to 30 June in the following year from Take 15
    d. 810,000 m³ during the period from 1 July in one year to 30 June in the following year from Take T3b

2. From *[5 years after the date of issue of this consent]* no abstraction shall occur from the Take 15 when flows in the Lindis River are equal to or less than 550 litres per second at the Otago Regional Council's Ardgour Road flow monitoring site, other than exercising this permit for reasonable domestic and stock drinking water purposes.

3. Other than exercising this permit for reasonable domestic and stock drinking water purposes, no abstraction shall occur from the Take T3b when flows in the Lindis River are equal to or less than 1,600 litres per second at the Otago Regional Council's Ardgour Road flow monitoring site.

13.2.10 Hayman

Water take as supplementary allocation at T2

Name: Pukemara Partnership Ltd

Address:

To take and use surface water from the Lindis River for the purpose of irrigation and storage.

For a term expiring: *[35 years from commencement of consent*

Location Details	***T2b (supplementary)***
Location of Point of Abstraction:	Along the Lindis River boundary of Pukemara property within 400m either side of MRAPA
Map Reference at Point of Abstraction NZTM 2000 (MRAPA):	1317900 5025815
Legal Description of land at point of abstraction:	SEC 6 BLK XV TARRAS SD
Legal Description of land where water will be used:	SEC 6 BLK XV TARRAS SD

1. The rate of abstraction must not exceed:
    a. 200 litres per second from Take T2b
    b. 2,825,280m³ during the period from 1 July in one year to 30 June in the following year from Take T2b

2. Other than exercising this permit for reasonable domestic and stock drinking water purposes, no abstraction shall occur from the Take T2b when flows in the Lindis River are equal to or less than 1,600 litres per second at the Otago Regional Council's Ardgour Road flow monitoring site.

13.2.11 Bruce and Linda Jolly – Ardgour Station

Water take as supplementary allocation at A6b

Name: *To be supplied to the ORC*

Address: *To be supplied to the ORC*

To take and use surface water from the Lindis River for the purpose of irrigation and storage.

For a term expiring: *[35 years from commencement of consent*

Location Details	***A6b (Supplementary)***
Location of Point of Abstraction:	Within the Dry Creek area 400m from the MRAPA
Map Reference at Point of Abstraction NZTM 2000 (MRAPA):	1316457E 5023599N
Legal Description of land at point of abstraction:	Lot 1 DP 25202 and Section 50 Block XVI Tarras SD
Legal Description of land where water will be used:	Ardgour Station: LOT 2 DP 509332

1. The rate of abstraction must not exceed:
    a. 100 litres per second from Take A6b
    b. 925,500m³ during the period from 1 July in one year to 30 June in the following year from Take A6b

2. Other than exercising this permit for reasonable domestic and stock drinking water purposes, no abstraction shall occur from the Take A6b when flows in the Lindis River are equal to or less than 1,600 litres per second at the Otago Regional Council's Ardgour Road flow monitoring site.

13.2.12 Cooke Family – Replace Existing Groundwater Permit

Take 18 (Consent 2001.995), Tarras Race water (not replacing Ardgour Race water) and T2

Name: Terence John Cooke and Josephine Cooke

Address: 69 Thomson Gorge Rd, Tarras, Cromwell

To take and use groundwater from a bore for the purpose of irrigation and storage.

For a term expiring: *[35 years from commencement of consent*

Location Details	**Take point 18**
Location of Point of Abstraction:	Tarras, approximately 250 metres Northwest of the intersection of Thomson Gorge Road and Ardgour Road. Cooke
Map Reference at Point of Abstraction (NZTM2000):	1314051E 5023082N
Legal Description of land at point of abstraction:	Lot 2 DP 300395
Legal Description of land where water will be used:	LOT 2 DP 455645, LOT 2 DP 300395

1. The rate of abstraction must not exceed:
    a. 25 litres per second from Take 18
    b. 364,500 m³ during the period from 1 July in one year to 30 June in the following year from Take 18

2. From *[5 years after the date of issue of this consent]* no abstraction shall occur from the Take 18 when flows in the Lindis River are equal to or less than 550 litres per second at the Otago Regional Council's Ardgour Road flow monitoring site, other than exercising this permit for reasonable domestic and stock drinking water purposes.

3. The consent holder shall fit a back flow preventer device to Take 18 and T5, to prevent contaminants from being drawn into the source of the water.

13.2.13 Tarras Farm Ltd

Take point 17, Consent 2000.690 Shepherds Creek

Name: Tarras Farm Ltd

Address: C/- Compass Agribusiness Management Limited, Unit 16, 46-50 Buckingham Street, Arrowtown 9302

To take and use surface water from Shepherds Creek for the purpose of irrigation and storage.

For a term expiring: *[35 years from commencement of consent*

Location Details	**Take point 17**
Location of Point of Abstraction:	Two points of take: An open race from Shepherds creek approximately 4 kilometres south east of the Lindis River, at the point where Shepherds Creek flows out from the foothills onto the terrace. A second point of take is a 40mm pipeline intake approximately 120metres upstream of the open race.
Map Reference at Point of Abstraction (NZTM 2000):	1315655E 5019181N (Water race). 1315755E 5019081N (Pipeline intake).
Legal Description of land at point of abstraction:	Unformed legal road, Sec 17 SO 24641 and Lot 4 DP 300805
Legal Description of land where water will be used:	LOT 2 DP 509332, Lot 1 DP 505064

1. The rate of abstraction must not exceed:
    a. 27.78 litres per second from Take 17
    b. 260,000m³ m³ during the period from 1 July in one year to 30 June in the following year from Take 17

13.2.14 Lindis Crossing Vineyard (Ex Beggs)

Take B1

Name: Lindis Crossing Vineyard

Address: Level 2, 11-17 Church Street, Queenstown, 9300

To take and use surface water from a groundwater bore for the purpose of irrigation and storage.

For a term expiring: *[35 years from commencement of consent*

Location Details	**Take point B1**
Location of Point of Abstraction:	Within a 400 m radius from MRAPA
Map Reference at Point of Abstraction (MRAPA):	1312671 5023499
Legal Description of land at point of abstraction:	LOT 1 DP 311352 Blk XIV SO 24642
Legal Description of land where water will be used:	LOT 1 DP 311352 Blk XIV SO 24642

1. The rate of abstraction must not exceed:
    a. 10 litres per second from Take B1
    b. 145,800 m^3 during the period from 1 July in one year to 30 June in the following year from Take B1
2. From *[5 years after the date of issue of this consent]* no abstraction shall occur from the Take B1 when flows in the Lindis River are equal to or less than 550 litres per second at the Otago Regional Council's Ardgour Road flow monitoring site, other than exercising this permit for reasonable domestic and stock drinking water purposes.

13.2.15 Cloudy Peak ex Beggs

Take Point B2 (same site as A2) - supplementary

Name: Cloudy Peak Ltd

Address: Level 1, 69 Tarbert Street, Alexandra 9320, New Zealand

To take and use surface water from the Lindis River for the purpose of irrigation and storage.

For a term expiring: *[35 years from commencement of consent*

Location Details	**Take Point B2 (same site as A2)**
Location of Point of Abstraction:	Within a 400m radius of the MRAPA
Map Reference at Point of Abstraction (NZTM200):	1317752E 5024986N
Legal Description of land at point of abstraction:	LOT 1 DP 450337 LOT 4 DP 450337
Legal Description of land where water will be used:	LOT 1 DP 450337 LOT 4 DP 450337

1. The rate of abstraction must not exceed:
    a. 15 litres per second from Take B2
    b. 243,000 m^3 during the period from 1 July in one year to 30 June in the following year from Take B2

2. From *[5 years after the date of issue of this consent]* no abstraction shall occur from the Take B2 when flows in the Lindis River are equal to or less than 1,600 litres per second at the Otago Regional Council's Ardgour Road flow monitoring site, other than exercising this permit for reasonable domestic and stock drinking water purposes.

13.2.16 Lindis Crossing Station

Take Point T4b - supplementary

Name: Lindis Crossing Station Ltd

Address: c/- Mackay Bailey Ltd, 109 Blenheim Road, Riccarton, Christchurch

To take and use surface water from the Lindis River for the purpose of irrigation and storage.

For a term expiring: *[35 years from commencement of consent*

Location Details	**Take Point T4b near T4**
Location of Point of Abstraction:	Within a 400m radius of the existing bore at: 100 metres to the south east of SH8, to a point located 360m north of the intersection of SH8 and Maori Point Road
Map Reference at Point of Abstraction (NZTM200):	E1312808 N5024716
Legal Description of land at point of abstraction:	LOT 1 DP 426163
Legal Description of land where water will be used:	LOT 1 DP 426163

1. The rate of abstraction must not exceed:
    a. 56 litres per second from Take T4b
    b. 729,000m^3 m^3 during the period from 1 July in one year to 30 June in the following year from Take T4b
    c. In combination with RM14.164.01 the total volume must not exceed 1,611,720m^3.

2. From *[5 years after the date of issue of this consent]* no abstraction shall occur from the Take T4b when flows in the Lindis River are equal to or less than 1,600 litres per second at the Otago Regional Council's Ardgour Road flow monitoring site, other than exercising this permit for reasonable domestic and stock drinking water purposes.

13.2.17 Malvern Downs (Robbie Gibson)

Take Point 21 and 22

Name: Malvern Downs Limited

Address: 3 Winders Road, Wanaka, New Zealand

To take and use surface water from Tarras Creek and from an unnamed spring near Tarras Creek for the purpose of irrigation and storage.

For a term expiring: *[35 years from commencement of consent*

Location Details	**Take Point 21**	**Take Point 22**
Location of Point of Abstraction:	Approximately 320m west of Jolly Road	Approximately 210 metres north west of State Highway 8, and approximately 800 to the west of Tarras township
Map Reference at Point of Abstraction:	1315781 5029008	1315781 5028244
Legal Description of land at point of abstraction:	Lot 2 DP 396149	
Legal Description of land where water will be used:		

1. The rate of abstraction must not exceed:
    a. 20 litres per second from Take 21
    b. 20 litres per second from Take 22
    c. 567,000m³ during the period from 1 July in one year to 30 June in the following year as a combined total from Take 21 and Take 22.

13.3 General Conditions for All Permits to Take and Use Water

The following conditions are general conditions that are proposed to be included with all of the consents.

Performance Monitoring

1.

a) The consent holder shall maintain a water meter to record the water take, within an error accuracy range of +/- 5% for a piped system; and +/- 10% for an open channel system, over the meter's nominal flow range, a telemetry compatible datalogger with at least 12 months data storage and a telemetry unit to record the rate and volume of take, and the date and time this water was taken.

b) The datalogger shall record the date, time and flow in litres per second.

c) Data shall be provided once daily to the Consent Authority by means of telemetry. The consent holder shall ensure data compatibility with the Consent Authority's time-series database.

General

2. This permit shall be exercised in accordance with a low flow agreement or rationing agreement approved by a water management group operating within the Lindis catchment. This agreement shall include the following condition:
    a. if flows in the Lindis River measured at the ORC Ardgour Road flow monitoring site flow site are equal to or below 700 L/sec for 14 consecutive days, abstraction from the Lindis catchment will be reduced with the aim (taking into account natural inflows) of delivering a flow of not less than 1000 L/sec at the Ardour Road flow monitoring site for a duration of not less than 12 hours, with preference given to delivering this increased flow overnight.

3. The consent holder shall take all practicable steps to ensure that there is no leakage from pipes and structures.
4. The intake shall be screened so as to prevent the ingress of small fish and elvers.

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Appendix A: Joint Witness Statement A

In the Environment Court of New Zealand

Christchurch Registry

ENV-2016-CHC-061

Under	the Resource Management Act (RMA)
In the matter of	An appeal under clause 14 of the First Schedule
Between	**Lindis Catchment Group Inc** (Appellant)
and	**Otago Regional Council** (Respondent)

Joint Witness Statement

The parties agree as follows.....

1. Updated Naturalised Flow Model. Based on the ORC Memo: File Note A1007144 (24/05/2017), it is agreed:

   - MALF set at 1,750 l/s
   - Q7-5 at 1,160 l/s and Q7-10 at 980 l/s

2. Longitudinal Hydrological Model. Information to be supplied and circulated by email by Jens Rekker by Tuesday 13 June 2017 with a view to reconvening before the next mediation to reach agreement where possible:

   Compare flows using the longitudinal flow model developed by Jens Rekker under the following two scenarios:

   - current infrastructure layout at a flow of 900 l/s at Ardgour Road Recorder and
   - a proposed 13 gallery intake layout 550 l/s at Ardgour Road Recorder

   and

   - a continuum summarising losses at different flows at both upper and lower losing reaches

   The methodology and findings in the report 'Lindis River Longitudinal Hydrological Simulation' (30 January 2017) is generally agreed, subject to the outcome of the new work as outlined above.

3. Braided River Assessment: File Note A978677 (8/02/17) is accepted.

4. Fish Passage Assessment: Greg Ryder to provide:

   An analysis of contiguous width for water ≥10 cm and ≥15 cm depth at fish passage transects LT3 and AT3 for the following 2 scenarios (from Point #2 above):

   - current infrastructure layout at a flow of 900 l/s at Ardgour Road Recorder and
   - a proposed 13 gallery intake layout 550 l/s at Ardgour Road Recorder

   The methodology and findings in the report 'Lindis River Low Flow Investigations Part A: Surveys of critical riffles for fish passage under low flow conditions' (June 2017) is generally agreed, subject to the outcome of the new work as outlined above.

   General discussion regarding eel passage as raised by Matt Dale, consensus reached was that as long as there is contiguous surface water there is upstream passage for eels. Downstream passage of adult eels is driven by freshes and is not an issue in terms of low flow. Greg will include a commentary on eels in his updated analysis.

   It was agreed that passage for yearling and/or adult trout would provide sufficient water depths for juvenile eels and other native fish species in the Lindis River.

5. Updated IFIM: It is agreed that the choice of type of habitat suitability curve can affect the outcome.

   The results of instream habitat modelling (Jowett 2016) are indicative only. These results should not be used to estimate levels of habitat retention, but indicate the likely relative change in habitat with changes in flow. The reasons for this are:

   - The instream habitat model was developed based on surveys taken at 2 flows: 5,200 l/s and 1,200 l/s.
   - The minimum flows being considered are 38-75% of the lowest calibration flow.
   - The model reach is upstream of SH8. The habitat in this reach is not identical to habitat downstream of SH8, and is likely to be less sensitive to changes in flow.

   Habitat quality for trout in the lower Lindis (below SH8) is worse than further upstream when flows are below MALF as a result of a combination of physical conditions, periphyton, fine sediments.

6. Temperature Assessment

   Assessments to date suggest that water temperatures in the lower Lindis (downstream of SH8) can be unsuitable for trout at times under current water allocation/demand. Data collected in 2016/17 season (Ryder & Goldsmith 2017) represent a relatively mild season compared to previous analysis (Dale & Olsen 2016).

   Further work to be undertaken by Greg to develop a calibrated water temperature model for the lower Lindis River, based on water temperature data from the Ardgour

Road flow recorder and the Lindis River at Clutha confluence temperature monitoring site, along with ambient air temperatures.

7. Implications of predation of juvenile brown trout on flow setting

   To be revisited following the further work undertaken by Greg, refer to point#4.

Signed:.....

Jens Rekker

Signed:.....

Rasmus Gabrielsson

Signed:.....

Morgan Trotter

Signed:.....

Murray Neilson

Signed:.....

Ian Jowett

Signed:.....

Greg Ryder.

Appendix B: Joint Witness Statement B

In the Environment Court of New Zealand
Christchurch Registry
ENV-2016-CHC-061

Under	the Resource Management Act (RMA)
In the matter of	An appeal under clause 14 of the First Schedule
Between	Lindis Catchment Group Inc (Appellant)
And	Otago Regional Council (Respondent)

Joint witness statement

The parties agree as follows:

1. Flow losses between Ardgour Road flow recorder and Clutha confluence
   - During periods of low flow (<1000 l/s) the average flow loss between Ardgour Road flow recorder and Clutha confluence is 450 l/s and a range of 400-500 l/s. The value used by Mr Rekker in his longitudinal model (450 l/s) is appropriate.

2. Longitudinal flow modelling

   Notes/clarifications sought:
   - Lawyers to provide clarification on how minimum flows are to be applied on mainstem of rivers; i.e. At a specific point on river (i.e. at Ardgour Road flow recorder), or throughout a reach of river
   - Mr Rekker to clarify on the rates of takes used under the two scenarios. Races scenario used present actual use = ~2,300 l/s, gallery abstraction scenario use = ~1,650 l/s. These allocation figures are for the whole catchment, not just takes from the mainstem of the Lindis.

   - This analysis considered two specific scenarios, namely:
     - Current infrastructure layout with a minimum flow of 900 l/s at Ardgour Road recorder, with a total primary allocation rate of take of ~2,300 l/s and
     - A proposed 13 gallery intake layout with a minimum flow of 550 l/s at Ardgour Road recorder with a total primary allocation rate of take of ~1,650 l/s.

   - The magnitude of the minimum flow, total allocation rate, location of water takes and the method of abstraction interact to determine the magnitude of flows in the river, and therefore the effects on instream values.

Experts agree that the figures prepared by Mr Rekker (Figure 1, 5) show that:
- At inflows to the study reach ("Cluden Stream confluence" to the Clutha Confluence) of 4,027 l/s– more flow throughout study reach with a min. flow of 550 l/s with galleries than with a min. flow of 900 l/s with existing races
- At inflows to the study reach of 3,600 l/s – more flow throughout study reach with 550 l/s with galleries than with 900 l/s with existing races
- At inflows to the study reach of 3,000 l/s– more flow throughout study reach with 550 l/s with galleries than with 900 l/s with existing races
- At inflows to the study reach of 2,502 l/s – more flow through study reach downstream to Ardgour Road flow recorder with 550 l/s with galleries than with 900 l/s with existing races, but equivalent flows from that point downstream to Clutha confluence.

DAO.
MR.

- At inflows to the study reach of 1,396 l/s - more flow through ~18 km of the upper study reach to a point approx 2 km upstream of the Ardgour Road flow recorder with 550 l/s with galleries than with 900 l/s with existing races, but flows from that point downstream to Clutha confluence are less with 550 l/s with galleries than with 900 l/s with existing races .

3. Fish passage modelling
   - Model scenarios based on longitudinal modelling of Mr Rekker.
   - The fish passage study reach is "the point" to the Clutha confluence"
   - Greg to provide Excel spreadsheet of results to other experts by Thursday 29 June 2017.

The experts agree that:
- Based on the fish passage criteria proposed by Cawthron[1], passage for adult trout is restricted within the losing reaches at flows of less than MALF.
- The results of fish passage modelling indicate that galleries with a min flow of 550 l/s provide more passage in upper drying reach than 900 l/s with existing races.
- Neither scenario satisfies the proposed passage criteria[1] in the lower section (downstream of SH8) for yearling trout or adults.
- A minimum flow of 900 l/s provides deeper water in the riffles below SH8 than a minimum flow of 550 l/s, however it is unlikely that this will provide more passage opportunity for yearling trout.
- At flows below MALF, 900 l/s with existing races provides more opportunity for passage for young-of-the-year trout and native fish in the section downstream of SH8 than a min flow of 550 l/s with galleries.
- Mr Trotter is aware of the movement of adult trout in the lower Lindis (from confluence to Ardgour Road flow recorder) at flows of less than 1,700 l/s at the Ardgour Road flow recorder and has observed the extensive movement (several kms) of juveniles and yearlings at flows of approximately 500 l/s at the Ardgour Road flow recorder.

4. Instream habitat modelling
   - For the species/life-stages of interest in this case (juvenile and adult brown trout, invertebrate food producing), the optimum flows are likely to occur at flows in excess of the natural MALF. This means that within the range of flows being considered, more flow will result in more habitat for these species/life-stages.
   - Based on the outcomes of the longitudinal hydrological modelling (as discussed in #2 above). When inflows to the study reach >2,500 l/s, a minimum flow of 550 l/s with gallery intakes is predicted to provide more habitat for brown trout and invertebrate prey habitat than a minimum 900 l/s with races.
   - At inflows of 1,396 l/s more habitat for brown trout and invertebrate prey is expected in ~18 km of the upper study reach to a point approx 2 km upstream of the Ardgour Road flow recorder with a minimum flow of 550 l/s with galleries than with a minimum flow of 900 l/s with existing races. But from that point downstream to Clutha confluence, there is predicted to be more brown trout and invertebrate prey habitat with 900 l/s with existing races than with galleries with 550 l/s.

[1] Gabrielsson, R. and Hay, J. 2017. Review of fish passage criteria for assessing implications of minimum flow options. Prepared for Otago Fish & Game Council. Cawthron Report No. 3014.

DAO
MK.
MD

5. **Implications of predation of juvenile trout on flow setting**
   - Higher flows are expected to reduce the risk of predation of juvenile trout,
   - At inflows of 1,396 l/s, there is predicted to be less predation risk for juvenile trout within the ~18 km of the upper study reach to a point approximately 2 km upstream of the Ardgour Road flow recorder in this section of the river with a minimum flow of 550 l/s with galleries than with 900 l/s with existing races. However, predation risk is lower for the section from that point downstream to Clutha confluence is lower with 900 l/s with existing races than with 550 l/s with galleries.

6. **Periphyton biomass and fine sediment**
   - Periphyton biomass and fine sediment are dependent on the time since the last significant flushing flows and frequency of flushing flows.
   - Neither of the two flow scenarios considered are expected to significantly affect the frequency or magnitude of such flushing flows.

Signed: _____
Greg Ryder

Signed: _____
Matt Hickey

Signed: _____
Morgan Trotter

Signed: _____
Jens Rekker

Signed: _____
Matt Dale

Signed: _____
Ian Jowett

Signed: _____
Dean Olsen

Signed: _____
Murray Nelson

Signed: _____
Rasmus Gabrielsson

Appendix C: Photos of existing intake sites

Note: Photos of intakes for Take 11, 12, 13 and 16 not included as these will be disestablished under this proposal

Take Point 1, Station Creek, 96196

Take Point 2, McKenzie Creek, 99298

This intake hasn't been used for many years.

Take Point 3, Rocky Creek, 96638.v2

Take Point 4, Long Spur Creek, 96637.v2

Take point 3 and 4 measuring

Combined measuring for Take Point 3 and 4

Take Point 5, Lindis River, Numerous Consents

River intake site

Measuring site

Screens on pumped intakes from Lindis race

Take Point 6, Timburn Creek, 97059.v2

Take Point 7a, Cluden Creek, 7b Coal Creek 96077,99021


Cluden Creek


Coal Creek. Race diversion site and screen on intake

Take Point 14, Waiwera Creek, 96967


Take Point 15, Lindis River, 2001.544.v1

Take Point 17, Shepherds Creek, 2000.690

Take Point 18, Bore permit, 2001.995

Site of existing bore

Centre pivot irrigation with water from Take 18

Appendix D: Assessment of Effects on Instream Ecology due to Water Takes from Tributaries of the Lindis River

Assessment of Effects on Instream Ecology due to Water Takes from Tributaries of the Lindis River

Assessment undertaken by Matt Hickey

Water Resource Management Ltd

September 2017

Prepared for the Lindis Catchment Group

September 2017

by Matt Hickey

Contents

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Tables

1. Executive Summary

The effects of 16 takes from 14 streams in the Lindis catchment have been assessed. Where appropriate, residual flows that protect ecological values have been recommended (
Table 1). Natural low flows in the streams assessed are very low, with many of the streams assessed having natural low flows of 0.010 m^3/s or less.

Nine of the 14 streams assessed dry naturally in their lower reaches due to a combination of groundwater losses and low flows. Often these streams exit confined gorge sections and flow across alluvial gravel reaches before they reach the Lindis River. In most cases the takes from these streams are at the most downstream extent of the naturally flowing reach. In the streams which dry naturally no residual flows are recommended; however, these streams under the existing take regime hold populations of mainly brown trout in their perennial reaches.

Where streams are shown to flow continuously all year and maintain connection with the Lindis River, residual flows are proposed to maintain aquatic values.

Many of the tributaries of the Lindis hold high densities of small brown trout which have no recreational fishery value nor are they likely to contribute significantly to downstream trout fisheries. The key tributary that is the exception to this is Cluden Stream which is a recognised high value trout spawning and rearing stream.

Clutha flathead galaxiids do not occur below any of the existing takes, with the exception of Cluden Stream. Only two populations of Clutha flathead galaxiids in the Lindis appear to be free from competition with trout (Short Spur Creek and Big Spur Creek).

Longfin eels are rare throughout the catchment even in tributaries with continuous flow and ample eel habitat, with few records of their presence after the 1980's. Clearly the lack of eels is not due to a lack of habitat but most likely due to the lack of elvers passing the Roxburgh and Clyde dams on the Clutha River.

Table 1: Summary table of flows and recommended residual flows for each take.

Stream	Min Recorded Daily Average flow (m^3/s)	7- Day Mean Annual Low Flow (MALF) (m^3/s)	Proposed Residual Flow Condition	Minimum Flow Applies
Cluden Swamp Spring at Take	No data	No data	No residual flow. The spring is artificial and is heavily modified. Existing spring is captured by LIC races.	No (not connected to the Lindis River)
Unnamed Spring at Take (estimated from take data)	0.012	0.013	a visible surface flow is maintained below the take maintaining upland bully and brown trout habitat below the take.	No (not connected to the Lindis River)
Tarras Creek at Take	No data	No data	No residual flow. The creek is ephemeral and is heavily modified. Existing creek is captured by LIC race.	No (not connected to the Lindis River)
Shepherd Creek at Take	<0.001	~0.001	No residual flow. The stream naturally dries due to a combination of groundwater losses and low flows below the take.	No (not connected to the Lindis River)
Waiwera Creek at Take	0.010	0.015	a visible surface flow is maintained below the take to the first tributary entering Waiwera Creek on the true right, approximately 100m below the take	Yes
Cluden	0.028	0.033	0.005 m^3/s residual flow to	Yes

Stream at Take			maintain surface water connection and provide for ecological values.	
Coal Creek at Take (augmented flow from Cluden Stream)	0.018	0.028	No residual flow. The stream naturally dries due to a combination of groundwater losses and low flows below the take.	Yes
Tim Burn at ORC Flow Site	0.004	0.007	No residual flow. The stream naturally dries due to a combination of groundwater losses and low flows below the take.	Yes
Nine Mile Creek at Take	0.004	0.008	No residual flow. The stream naturally dries due to a combination of groundwater losses and low flows below the take.	Yes
Eight Mile Creek at Take	0.003	0.005	No residual flow. The stream naturally dries due to a combination of groundwater losses and low flows below the take.	Yes
Long Spur Creek at Take	0.008	0.011	No residual flow. The stream naturally dries due to a combination of groundwater losses and low flows below the take.	Yes
Rocky Creek at Take	0.015	0.023	No residual flow. Immediately below its confluence with Long Spur Creek the stream naturally dries due to a combination	Yes

			of groundwater losses and low flows below the take.	
McKenzie Creek at SH 8 Bridge	0.010	0.015	0.015 m^3/s residual flow to provide for the ecological values.	Yes (Supplementary)
Station Creek at SH 8 Bridge	0.012	0.018	0.020 m^3/s residual flow to provide for the ecological values.	Yes (Supplementary)

2. Scope

The scope of this report is to provide an assessment of hydrology and aquatic ecology of the above streams. The potential application of residual flows is investigated on a case by case basis.

3. Available Information

This assessment relies heavily on the following pieces of information:

1. Flow records collected by Otago Regional Council (ORC) from Wainui Creek, Cluden Stream, Coal Creek, Eight Mile Creek, Rocky Creek and Tim Burn for the period November 2012 to January 2017.
2. Water metering information supplied by the water users on each stream.
3. Information from NIWA's Freshwater Fish Database and personal observations.
4. Electric Fishing survey carried out by Department of Conservation (DoC) and Water Resource Management Ltd (WRM Ltd) in September 2017.
5. Landowner observations.
6. Photographic observations by water users.

4. Introduction

The Lindis Catchment Group is looking to renew existing water takes from the tributaries of the Lindis River. Currently there are 16 takes from 14 tributary streams. These streams are:

- Unnamed Spring
- Cluden Swamp Spring
- Tarras Creek
- Shepherds Creek
- Waiwera Creek
- Cluden Stream
- Coal Creek
- Tim Burn
- Eight Mile Creek
- Nine Mile Creek
- Long Spur Creek
- Rocky Creek
- McKenzie Creek
- Station Creek

Apart from the minimum flow that applies to all takes in a catchment residual flows are the key mechanism for protecting ecological values in tributaries, especially where the tributary is hydrologically different to the mainstem. Residual flows are specific to an individual point of take and apply in concert with a minimum flow (both the minimum and residual flow must be met for water to be taken). A residual flow is the amount of water

that must be left at a point of take to provide for ecological values and natural character of that waterbody.

When determining a residual flow, it is important to determine the ecological values to be protected, the natural hydrology of the stream at the point of take and the potential effects of the proposed take on those flows and subsequently the ecological values.

For the purpose of this assessment if a stream was determined to dry naturally downstream of the point of take no residual flow has been recommended. In streams that dry naturally it was assessed that drying these reaches for a longer duration would have an effect that was no more than minor.

If a stream was shown to flow continuously below the point of take and maintain a permanent connection to the Lindis River a residual flow has been proposed to provide for ecological values.

In this report, residual flows have either been expressed as a specific flow that must be left to pass the point of take (e.g. 0.005 m^3/s), or as a description such as 'a visible surface flow is maintained below the take to the first tributary entering Waiwera Creek on the true right, approximately 100m below the take'. When recommending a residual flow the length of reach affected and the distance downstream for when tributaries increase flows was considered.

Many of the tributaries of the Lindis hold high densities of small brown trout which have no recreational fishery value nor are they likely to contribute significantly to downstream trout fisheries. The key tributary that is the exception to this is Cluden Stream which is a recognised high value trout spawning and rearing stream for the Lindis and Upper Clutha.

Brown trout and upland bullies are the most common species found below takes in tributaries of the Lindis River. Longfin eel would naturally occur throughout the catchment but are now almost completely absent from the tributaries even where ample eel habitat is present. This is simply due to recruitment being prevented by the Roxburgh and Clyde

dams. Cluden Stream is the only tributary where Clutha flathead galaxiids occur below a take and it is thought that these individuals have come from trout free tributaries upstream (Daniel Jack[1] pers, comm.)

The remainder of this report investigates on a case by case basis whether the application of residual flows for each take is necessary to provide for ecological values.

[1] Daniel Jack Freshwater Ranger for the Department of Conservation.

5. Cluden Swamp Spring

The Cluden Swamp Spring rises near Tarras and has two consented takes from it. (Figure 1).

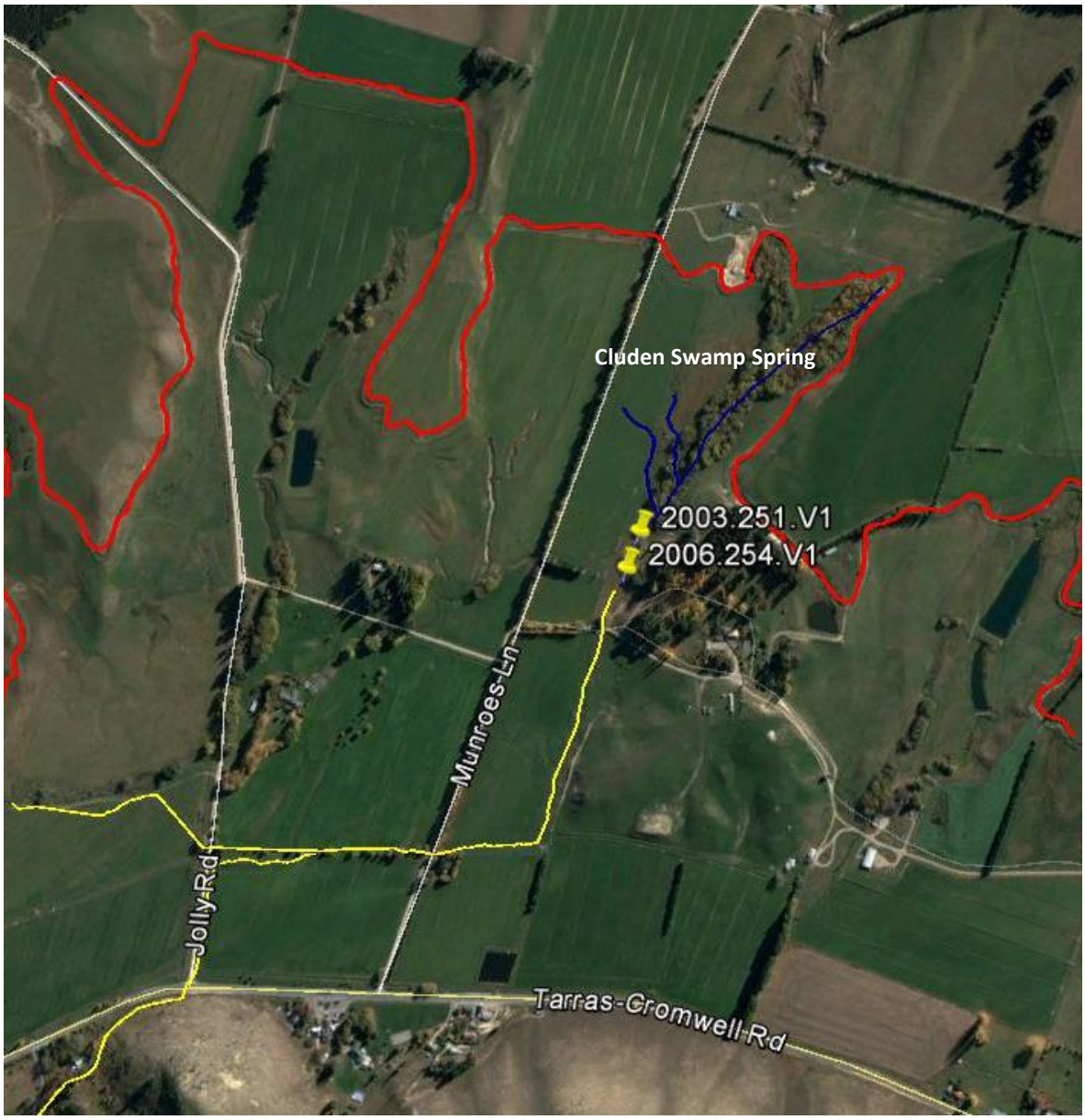


Figure 1. Map showing the Cluden Swamp Spring (in blue) as well as the takes from it (2003.251.V1 and 2006.254.V1). Also shown is the LIC main race (in red) and other LIC distribution races (in yellow) that the existing spring feeds into.

The Cluden Swamp Spring flows due to the modified hydrology associated with irrigation practices (historically border dyke), leakage from distribution races and augmentation from the LIC main race. The Cluden Swamp Spring ends up in an LIC distribution race shortly after it rises (Figure 1).

Information from the landowner suggests that the Cluden Swamp Spring carries a constant flow above the take. There is no flow or take information for the Cluden Swamp Spring takes. Further

complicating things is that the Cluden Swamp Spring is augmented with up to 0.550 m^3/s from the LIC main race and is used to transfer water to other distribution races.

The Cluden Swamp Spring does not (and would not) connect downstream with any other stream or river and any water associated with it is collected by LIC races and used for irrigation (Figure 1).

5.1. Instream Ecology

Schedule 1A of the Regional Plan: Water for Otago makes no mention of significant ecosystem values being present in the Cluden Swamp Spring (ORC, 2016).

A search of NIWA's Freshwater Fish Database for the Cluden Swamp Spring catchments has no records of fish.

A survey carried out by DoC and WRM Ltd in September 2017 of Cluden Swamp Spring found upland bullies present in good numbers.

5.2. Residual Flow Discussion

Cluden Swamp Spring flows due to a combination of irrigation on the surrounding land, leakage from the LIC race and augmentation of up to 0.550m^3/s from the LIC main race. As a result, the spring flows at between ~0.010 – 0.550 m^3/s during summer. Observations by the landowners suggests that there is always a continuous flow upstream of the takes in the Cluden Swamp Spring. It is unlikely that the spring is natural.

Upland bullies are found in the Cluden Swamp Spring and the spring does not connect with any other stream but ends up in existing water races and is used for irrigation (Figure 1).

If the LIC races are decommissioned as part of the consenting and minimum flow process it is highly likely that this spring will cease to flow in the summer months.

The Cluden Swamp Spring appears to be artificial due to the LIC races and associated water use, and is incorporated into LIC's existing race infrastructure. The fish present are there due to their ability to colonise the available habitat and persist in a heavily modified environment within the LIC scheme.

As the current fish population appear to be opportunistic and persists in the habitat available within the irrigation scheme no residual flow is recommended.

5.3. Summary

- The Cluden Swamp Spring is most likely the result of water use practices and is artificial.
- The spring does not flow into any downstream river or stream.
- Upland bullies have been found in the Cluden Swamp Spring.
- The spring currently ends up in LIC distribution races shortly after it rises.
- No residual flow is recommended.

6. The Unnamed Spring

The Unnamed Spring rises near Tarras and currently has a single consented take (2001.546), while a further take is proposed (Figure 2).

Figure 2. Map showing the Unnamed Spring (in blue) and the existing take from it (2001.546) as well as the "proposed take". Also shown is the LIC main race (in red) and the Lower LIC race (in yellow) including where the race terminates.

The Unnamed Spring flows due to the modified hydrology associated with irrigation practices (historically border dyke) and leakage from the LIC main race. The Unnamed Spring doesn't flow to any downstream streams but ends in the LIC lower race (Figure 2).

Information from the landowners suggests that the Unnamed Spring carries a constant flow and that there is always a residual flow below the existing take. The take data for consent 2001.546 suggests the spring flows at ~0.010 – 0.030 m^3/s through the middle of summer.

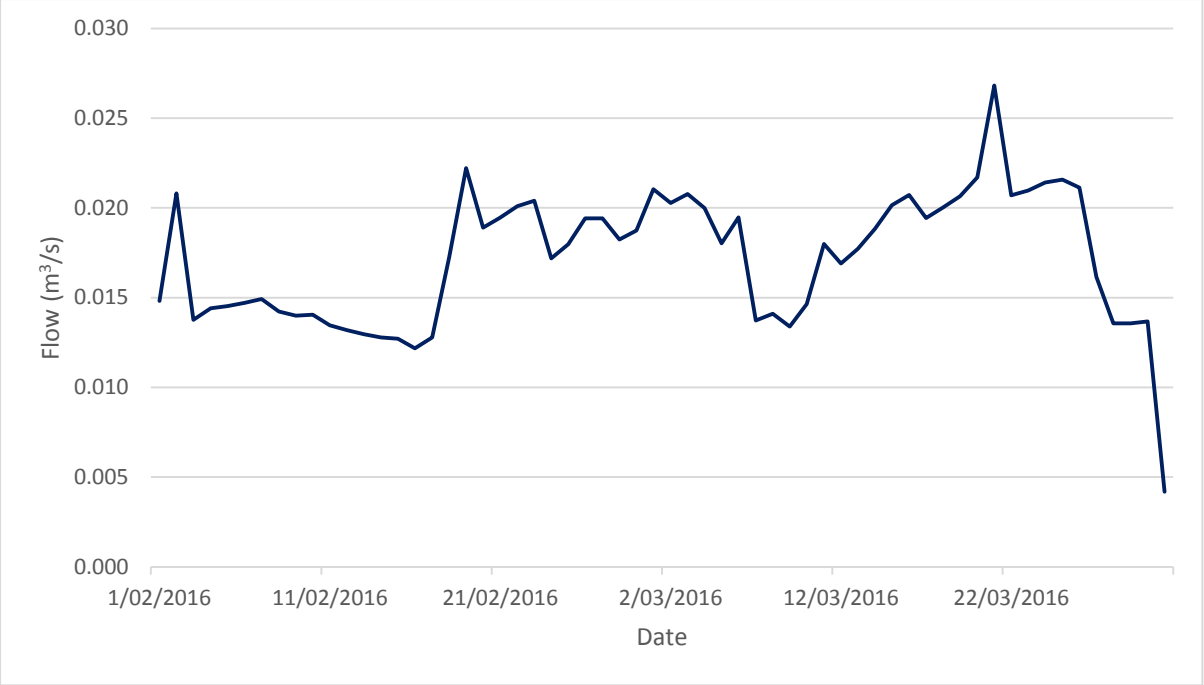


Figure 3. Take data as a daily average flow for consent 2001.546 from the Unnamed Spring for February – March 2016.

6.1. Instream Ecology

Schedule 1A of the Regional Plan: Water for Otago makes no mention of significant ecosystem values being present in the Unnamed Spring (ORC, 2016).

A search of NIWA's Freshwater Fish Database for the Unnamed Spring shows the catchments has no fishery records.

A survey carried out by DoC and WRM Ltd in September 2017 of the Unnamed Spring found upland bullies and brown trout are present.

6.2. Residual Flow Discussion

At the existing take location during summer the flow in the Unnamed Spring is ~0.010 – 0.030 m^3/s. observations by the landowners suggests that there is always a continuous flow below the take.

The "proposed take" is located where the Unnamed Spring enters LIC's lower main race; from this point down the race can be dry.

Upland bullies and brown trout occur in the Unnamed Spring. The spring doesn't connect with any other stream or river and the spring ends up in an existing water race and is used for irrigation (Figure 2).

Due to its hydrological isolation from any other rivers the Unnamed Spring does not provide any value as sports fishery or trout spawning stream.

As the current fish population has been maintained by the existing residual flow it seems appropriate to apply it going forward to the existing take.

Because the “proposed take” is from an existing race and flows have historically ceased before the race terminates no residual flow is recommended (Figure 2).

6.3. Summary

- The Unnamed Spring is likely to flow in part due to water use practices.
- The Unnamed Spring does not connect with any downstream river or stream.
- Upland bullies and brown trout are present in the Unnamed Spring.
- The Unnamed Spring ends up in LIC’s lower race.
- Rather than a flow rate at the point of take it is proposed that a visible surface flow is maintained below the existing take.
- No residual flow is recommended at the “proposed take”, as it is within the race infrastructure and flows terminate a short distance downstream.

7. Tarras Creek

Tarras Creek is a heavily modified creek which begins near Tarras before flowing a short distance and joining the Maryland's race. (Figure 4).

Figure 4. Map showing Tarras Creek (in blue) as well as the proposed take from it where it enters the Maryland's race. Also shown is the LIC main race (in red) and the Maryland's Race (in yellow) that Tarras Creek flows into.

Tarras Creek flows due to the modified hydrology associated with irrigation practices (historically border dyke runoff). Tarras Creek ends up in an LIC distribution race shortly after it begins (Figure 4).

Information from the landowner suggests that Tarras Creek flows in winter following rain and that in summer it can be dry depending on irrigation practices. There is no flow information for Tarras Creek.

Tarras Creek does not connect downstream with any other stream or river and any water associated with it is collected by an LIC race and used for irrigation (Figure 4).

7.1. Instream Ecology

Schedule 1A of the Regional Plan: Water for Otago makes no mention of significant ecosystem values being present in Tarras Creek (ORC, 2016).

A search of NIWA's Freshwater Fish Database for the Tarras Creek catchment has no records of fish.

As Tarras Creek has historically dried in summer it is likely that no fish are present.

7.2. Residual Flow Discussion

Tarras Creek appears to flow during winter following rain, while in summer it can be dry for extended periods. Historically summer flows in Tarras Creek have been driven by irrigation run-off from border dyke irrigation or following rain events.

Tarras Creek does not connect with any other stream but ends up in existing water race and is used for irrigation (Figure 4).

If the LIC races are decommissioned as part of the consenting and minimum flow process it is highly likely that Tarras Creek will cease to flow in the summer months.

The intermittent nature of flows in Tarras Creek, the fact it only flows a short distance before entering an existing water race, and its highly modified state means no residual flow is recommended for the proposed take.

7.3. Summary

- Tarras Creek dries during summer and intermittently flows due to irrigation run-off.
- The creek does not flow into any downstream river or stream.
- The creek currently ends up in LIC distribution races shortly after it begins.
- No residual flow is recommended for the proposed take.

8. Shepherds Creek

Shepherds Creek is a small tributary with a catchment area of 16 km^2. Although it is in the Lindis Catchment it rarely flows to the Lindis River except in a flood event. There is one take from Shepherds Creek under consent 2000.690 (Figure 5).

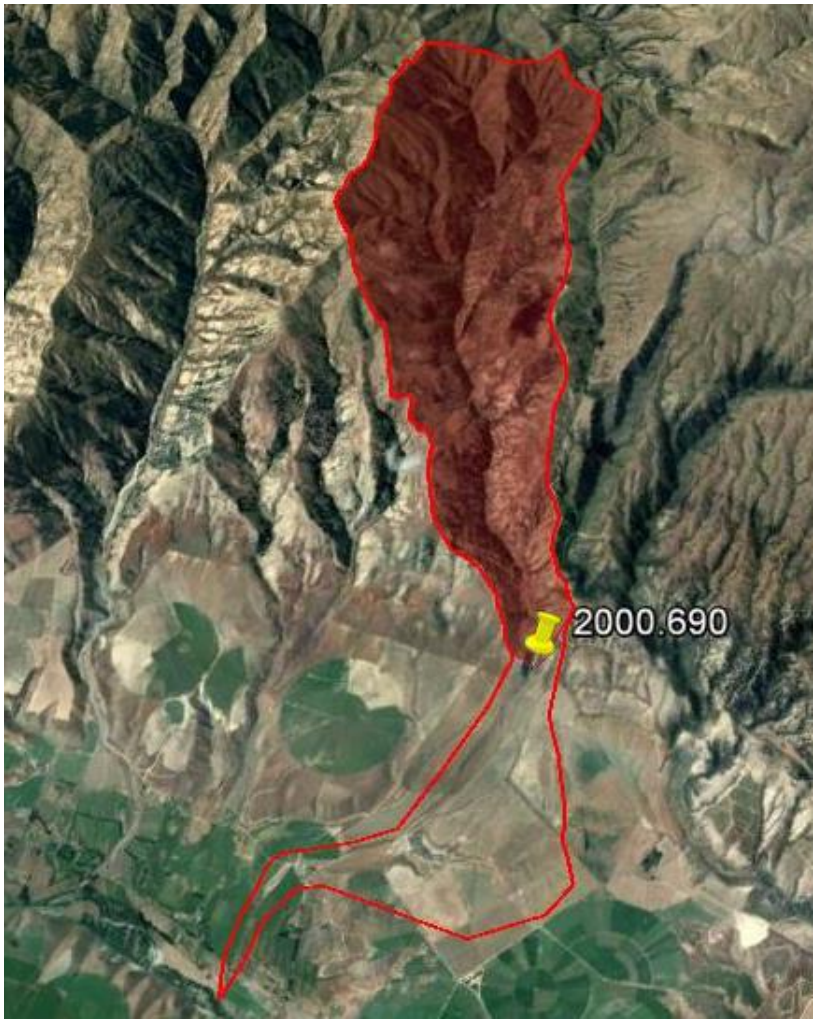


Figure 5 Map showing the Shepherds Creek catchment above the existing take 2000.690.

Shepherds Creek doesn't have any flow information. As all flow during summer is taken under consent 2000.690 the recorded take can be assumed to be the natural flow at the point of take. Figure 6 below provides a graph of the take data for consent 2000.690 for the 16/17 summer.

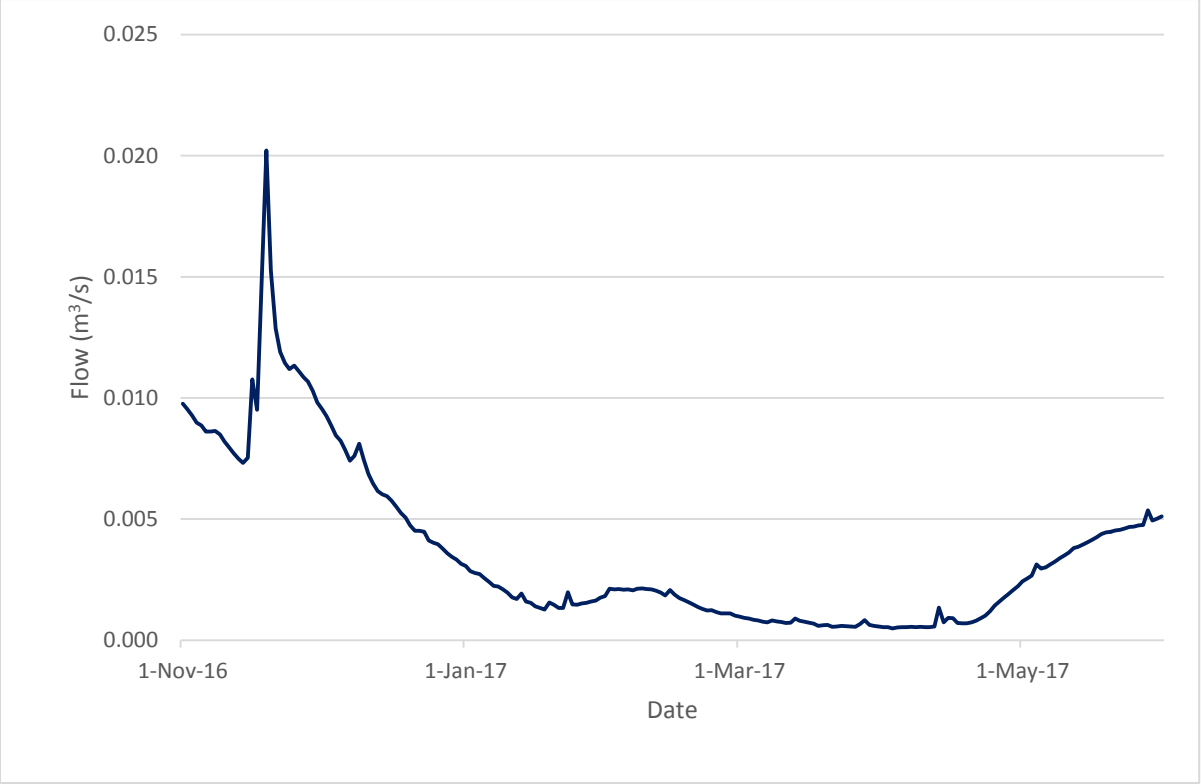


Figure 6. Shepherds Creek take data from November 2016 to end of May 2017.

Figure 6 shows that generally, Shepherds Creek flows recede from December with very low flows from January through to March. The flow pattern outlined above is evident in all take data for consent 2000.690 indicating that Shepherds Creek has a natural 7-Day MALF of ~0.001 m^3/s at the point of take.

8.1. Instream Ecology

Schedule 1A of the Regional Plan: Water for Otago makes no mention of significant ecosystem values being present in Shepherds Creek (ORC, 2016).

A search of NIWA's Freshwater Fish Database for the Shepherds Creek catchment shows 2 records with no fish being present (Figure 7).

Shepherds Creek rarely connects to the Lindis River mainstem which has most likely prevented fish moving into the catchment.

Figure 7. Fish Distribution Map for Shepherds Creek from the NIWA FWFDB in July 2017.

8.2. Residual Flow Discussion

Shepherds Creek experiences naturally very low flow with a naturalised 7-day MALF at the existing take location of ~0.001 m^3/s. Observations by the landowner suggests that Shepherds Creek can dry to isolated pools upstream of the take, and that Shepherds Creek rarely connects to the Lindis River due to losses to ground in the lower reaches (like the neighbouring Dry Creek).

Electric fishing surveys by DoC have identified no fish in the catchment including upstream in the perennial reach. Due to no fish being present and the natural losses to ground below the take preventing connection to the Lindis, except in very high flows, there is little point imposing a residual flow for ecological reasons.

8.3. Summary

- Shepherds Creek naturally experiences low summer flows at the existing point of take (~0.001 m^3/s).
- Shepherds Creek does not connect to the Lindis River except in a flood event.
- No fish have been recorded in the catchment.
- No residual flow is recommended.

9. Waiwera Creek

Waiwera Creek is a small tributary with a catchment area of 19 km^2 entering the Lindis on the true left immediately downstream of the Ardgour Bridge over the Lindis River (Figure 8). There are two take points associated with consent 96067.V2, however only the most upstream take point is used and going forward this will be the only take location applied for.

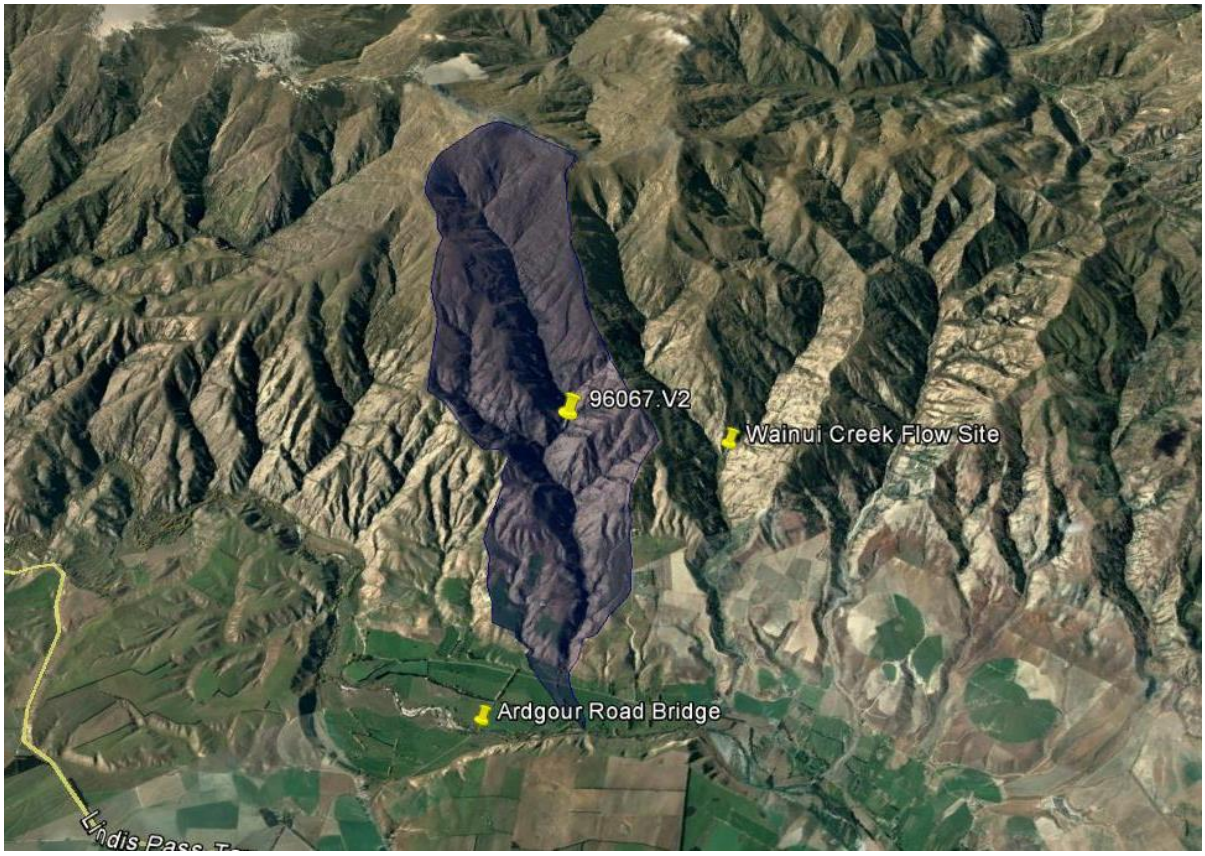


Figure 8. Map showing the Waiwera Creek catchment with the existing take location for 96067.V2, Ardgour Road Bridge over the Lindis and ORC's Wainui Creek flow site.

Waiwera Creek doesn't have any flow information, so a synthetic flow was created from flows recorded in the neighbouring Wainui Creek (after accounting for takes), providing two and a half seasons of naturalised data. Figure 9 shows the relevant Wainui Creek flow site with a catchment area of 19 km^2 and the catchment area above take 96067.V2 on Waiwera Creek of 9 km^2.

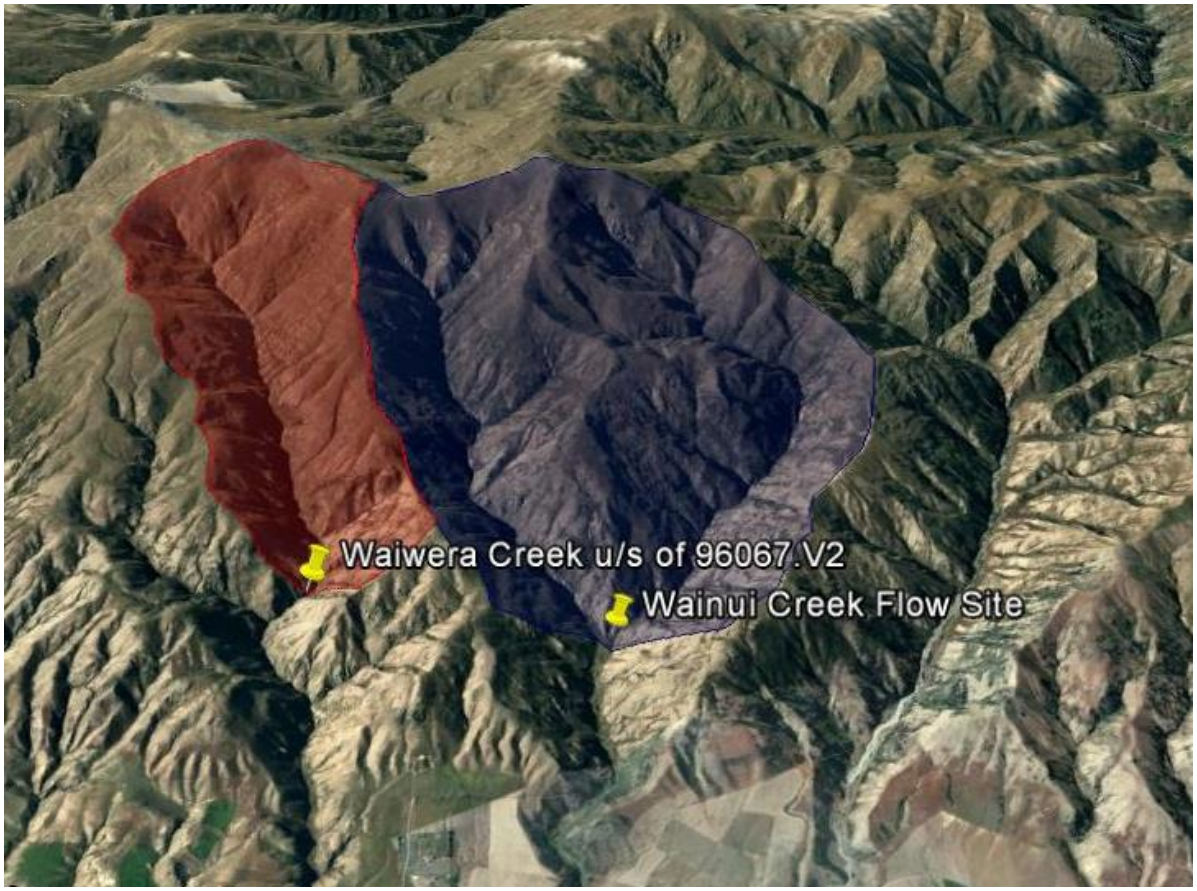


Figure 9. Map showing catchment area above ORC's temporary flow site in Wainui Creek, the catchment area above the take point for consent 96067.V2 in Waiwera Creek.

However, on closer inspection of the take data from consent 96067.V2 and discussion with the landowner it is apparent that Waiwera Creek has more stable and stronger base flows than would be expected based solely on Wainui Creek. Figure 10, as an example, shows the difference between the measured take for consent 96067.V2 compared to the modelled flow at the same location using Wainui Creek data. It clearly shows that basing flows in Waiwera Creek on Wainui Creek flows underestimates low flows in Waiwera Creek.

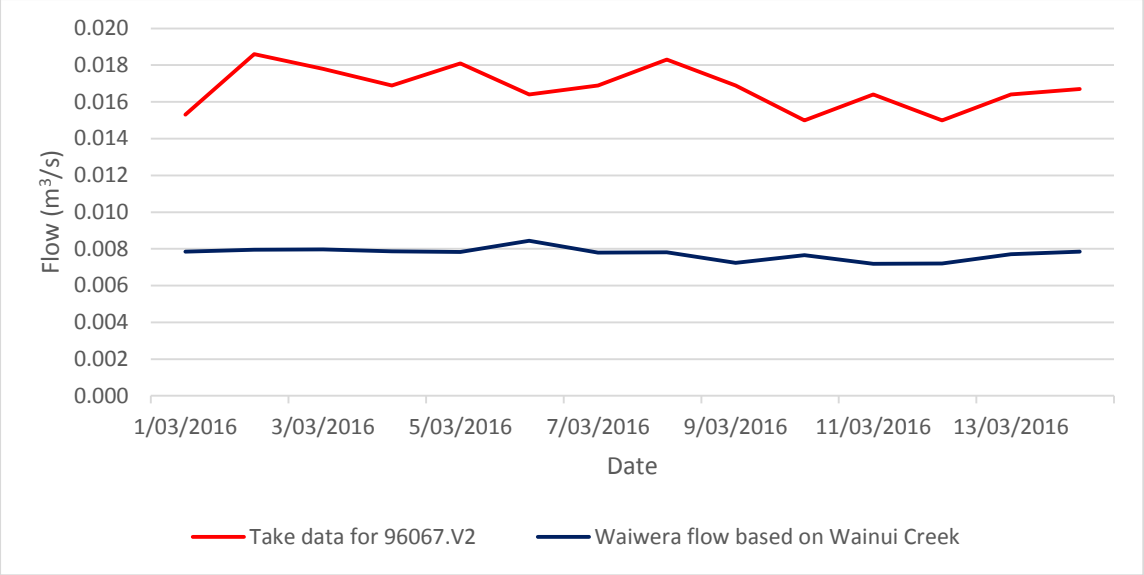


Figure 10. Example of difference between water taken at 96067.V2 compared to modelled flow at the same location based on data from Wainui Creek.

As a result of the observation outlined above, the synthetic flow record for Waiwera Creek has been created by assuming the measured take during the peak summer is an accurate reflection of the natural flow at the site (landowner observations suggest a small residual passes), and for the remainder of the year flows based on Wainui Creek have been used. Take data was not used for the whole year because during winter and early spring the take is not used, thus it would have underestimated flows.

Table 2 below provides basic flows statistics for the synthetic flow record for Waiwera Creek at the existing take based on measured take data for consent 96067.V2, and naturalised flows for the neighbouring Wainui Creek. It shows that Waiwera Creek is dominated by low stable flows, with flows generally less than 20 l/s much of the time.

Table 2: Daily Average Natural Flows for the Waiwera Creek at the Existing Take Point During November 2014 – Jan 2017.

Season	Min (m^3/s)	Median (m^3/s)	Mean (m^3/s)	Max (m^3/s)	7-day Min (m^3/s)
14/15	0.011	0.019	0.022	0.091	0.013
15/16	0.010	0.020	0.023	0.041	0.014
16/17[#]	0.016	0.027	0.031	0.140	0.018

[#] Flow record from 1st July 2016 – end of January 2017.

Figure 11 below provides a graph of the 15/16 hydrological year to understand the natural flow pattern on an annual time scale.

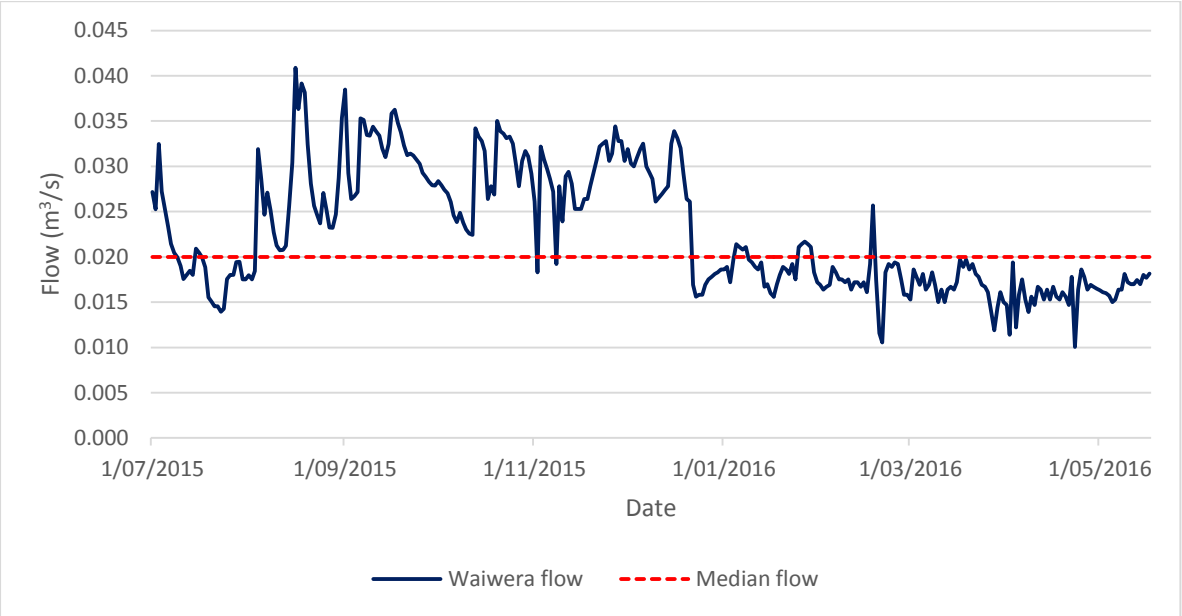


Figure 11. Natural daily flows for Waiwera Creek over a 12-month period (July 2015 -June 2016). Red dashed line is the median flow recorded for the period of 0.020 m^3l/s.

Figure 11 shows that generally Waiwera Creek has low but stable flow with few flushes. From August to December Waiwera Creek has higher sustained flows due to rain and snow melt.

9.1. Instream Ecology

Schedule 1A of the Regional Plan: Water for Otago makes no mention of significant ecosystem values being present in Waiwera Creek (ORC, 2016).

A search of NIWA's Freshwater Fish Database for the Waiwera Creek catchment shows 3 records with brown trout and upland bully being recorded below the existing take (Figure 12).

A survey carried out by DoC and WRM Ltd in September 2017 upstream, at and below the existing point of take did not detect any fish present indicating the gorgy nature of the creek below the take is preventing upstream fish passage.

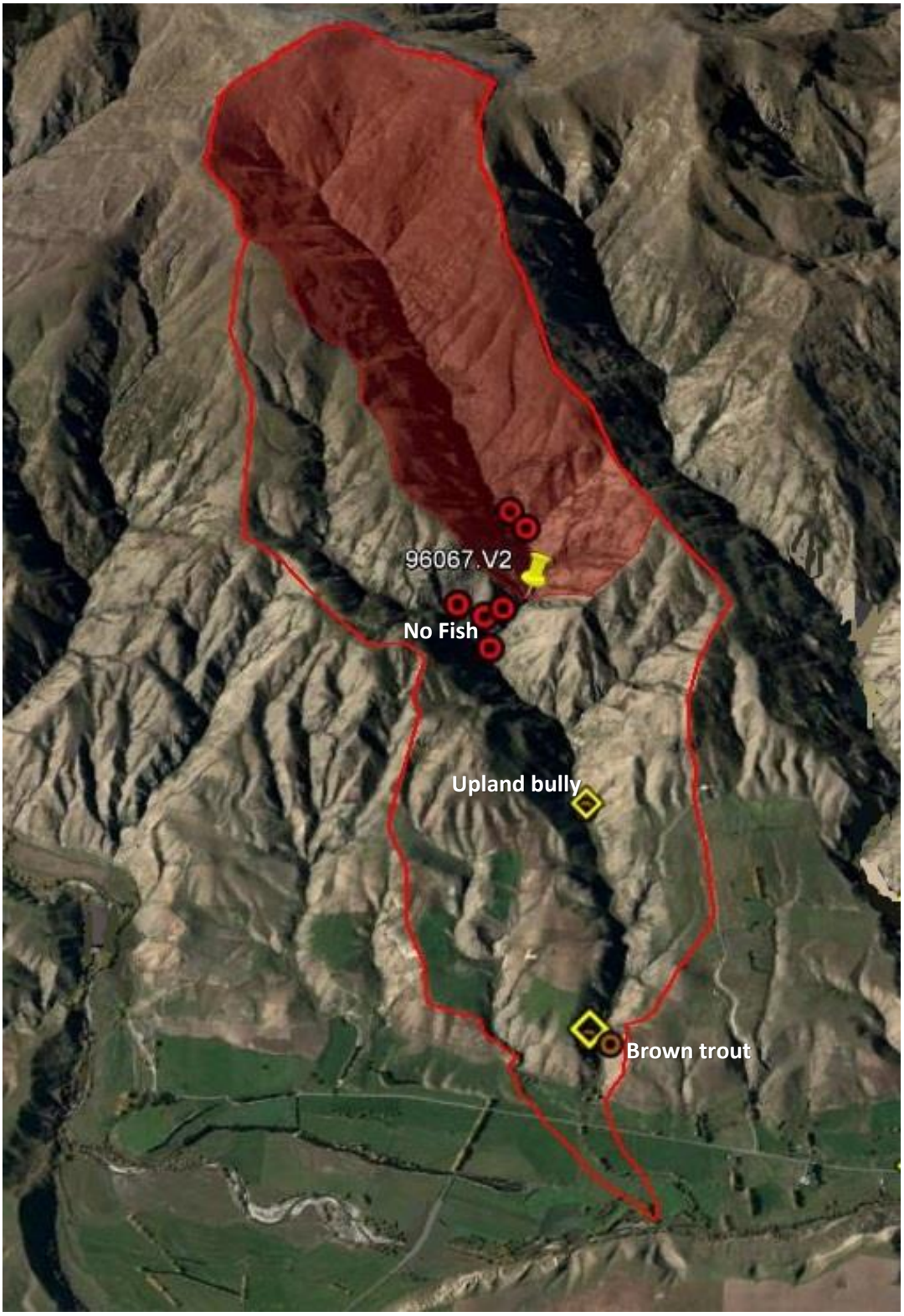


Figure 12. Fish Distribution Map for Waiwera Creek from the NIWA FWFDB in July 2017.

9.2. Residual Flow Discussion

Waiwera Creek experiences naturally very low flow with a naturalised 7-day MALF at the existing take location of ~15 l/s. Observations by the landowner suggests that there is always a continuous flow downstream of the existing take and that the first significant tributary enters ~100m downstream of the existing take, with further inputs from tributaries and springs quickly increasing flows ensuring at least 5 l/s in the lower Waiwera Creek over summer (Figure 13).

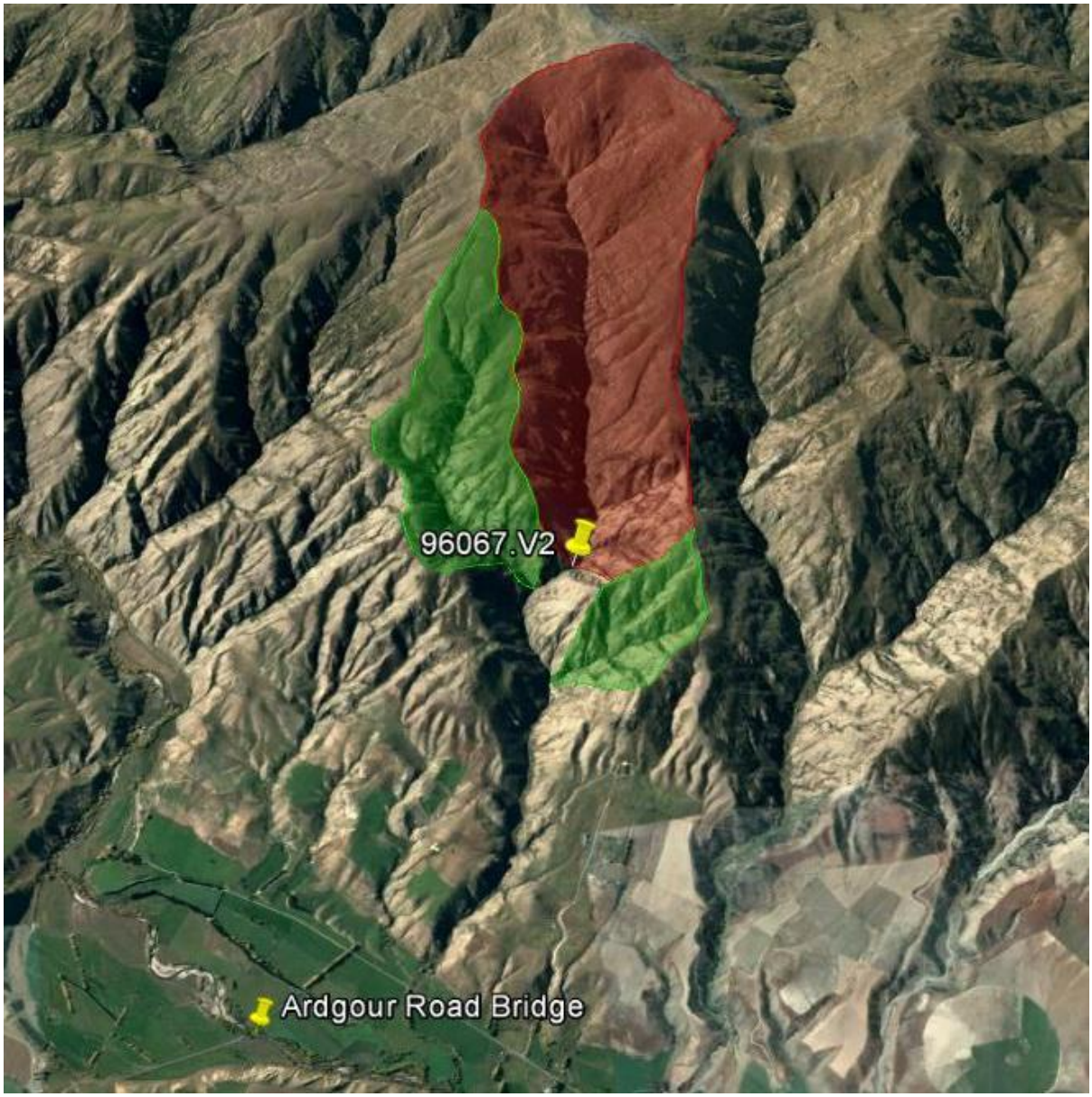


Figure 13. Additional tributaries contributing flow to Waiwera Creek downstream of the existing take shown in green.

Electric fishing surveys have identified that there are no fish in the mid to upper reaches of Waiwera Creek, while both upland bully and brown trout are present in the lower reaches below the existing

take (Figure 12). Brown trout numbers recorded also appear to be quite high with surveys finding 23 – 49 individuals at a time. Given the existing take has been in place for many years and fish numbers recorded downstream appear healthy for such a small stream, it suggests the existing management regime is ensuring effects are no more than minor.

9.3. Summary

- Waiwera Creek naturally experiences low summer flows at the existing point of take (less than 15 l/s).
- Two species of fish, brown trout and upland bully, have been recorded in the lower reaches of Waiwera Creek below a gorgy section of creek which appears to prevent upstream fish passage.
- Electric fishing surveys at, above and immediately below the existing point of take detected no fish present.
- Tributaries downstream of the existing take maintain flows in the lower Waiwera Creek which reduces the effects of the existing take.
- Rather than a flow rate at the point of take it is proposed that a visible surface flow is maintained below the take to the first tributary entering Waiwera Creek on the true right, approximately 100m below the take.

10. Cluden Stream

Cluden Stream is the largest tributary of the Lindis River downstream of the Lindis Peak flow site, with a catchment area of 122 km^2. There are two existing permits to take water from Cluden Stream taking from the same location. There is five hydrological years of data available for the lower Cluden Stream below the water takes (Figure 14).

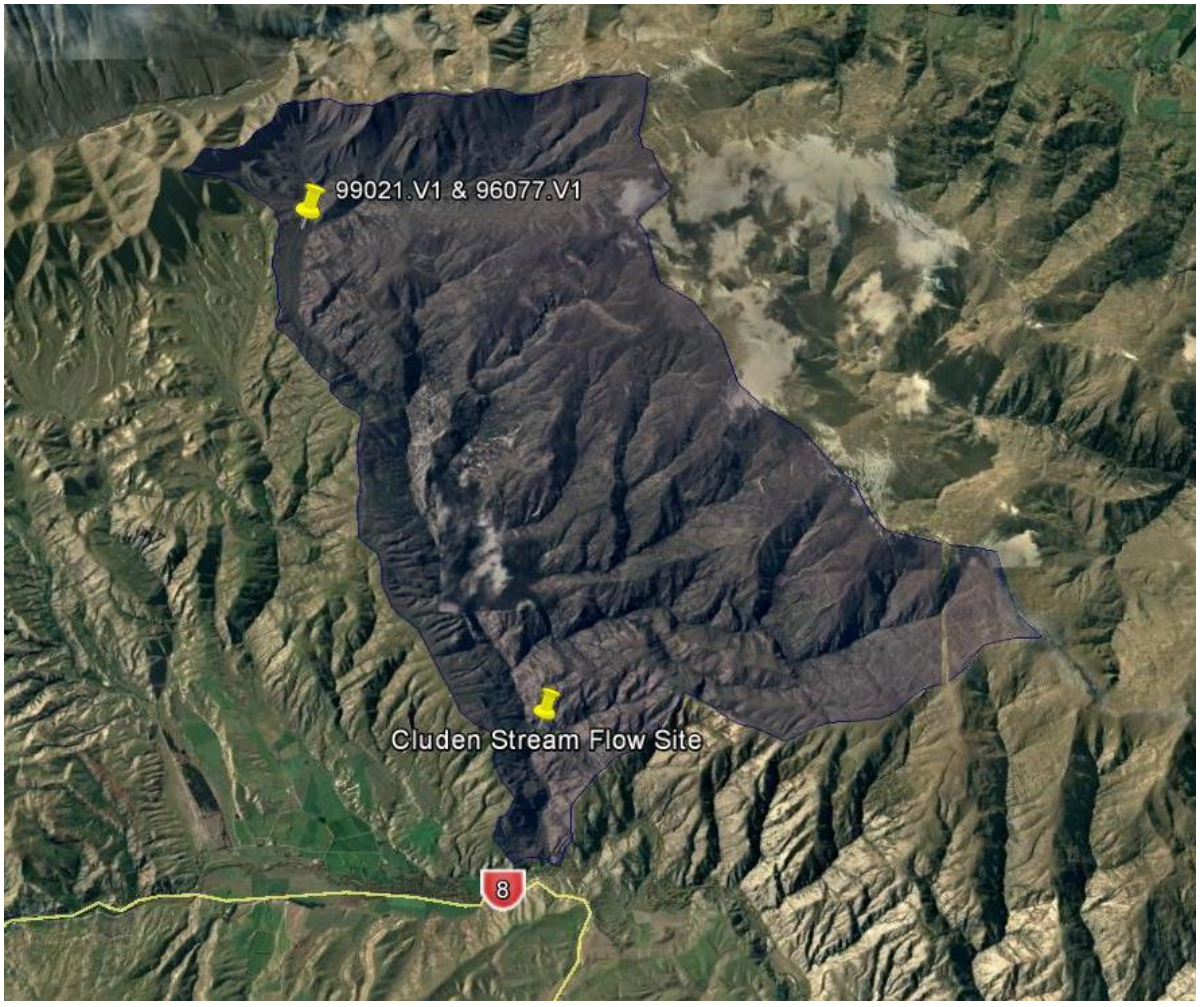


Figure 14 Cluden Stream catchment with the existing take locations and ORC's temporary flow site.

Table 3 below provides basic flows statistics for the entire data record for Cluden Stream; it shows that Cluden Stream always carries a good flow of water downstream of the existing take with the lowest daily flow recorded being 0.086 m^3/s during the 2015/16 summer.

Table 3: Daily Average Recorded Flows for Cluden Stream Recorded During November 2012 – May 2017.

Season	Min (m^3/s)	Median (m^3/s)	Mean (m^3/s)	Max (m^3/s)	7-day Min (m^3/s)
12/13	0.119	0.38	0.576	5.177	0.120
13/14	0.102	0.35	0.632	7.951	0.104
14/15	0.089	0.207	0.370	3.23	0.092
15/16	0.086	0.192	0.377	2.036	0.087
16/17	0.11	0.287	0.33	2.983	0.114

Figure 15 below provides a graph of the 13/14 hydrological year to understand Cluden Stream's flow pattern on an annual time scale.

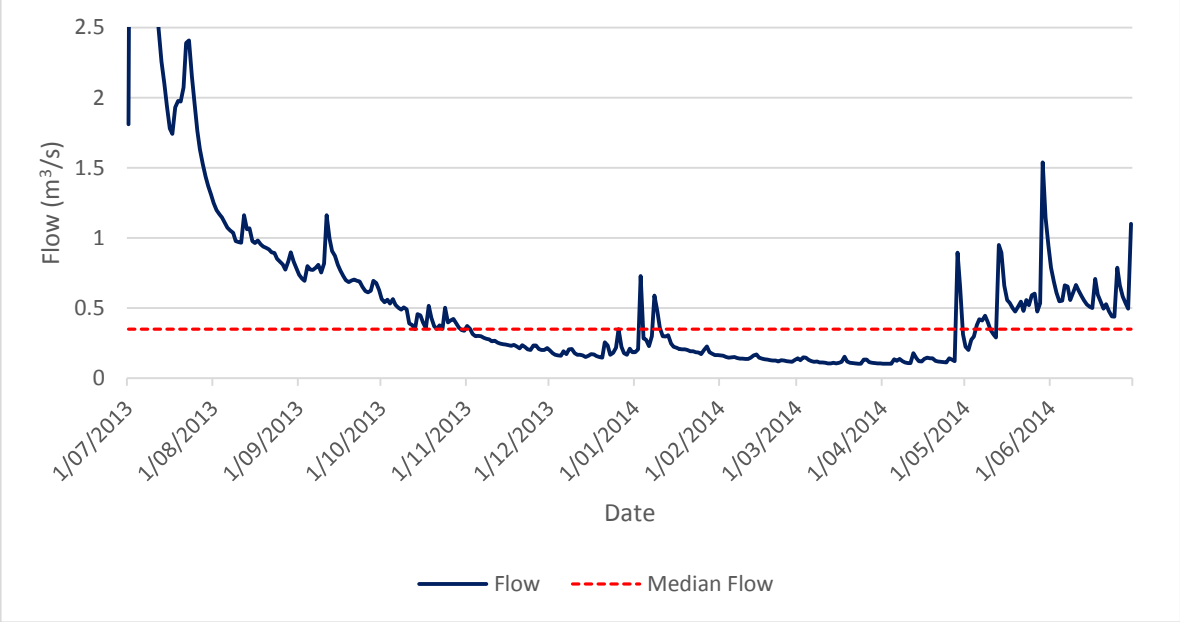


Figure 15. Recorded daily flows for Cluden Stream for a 12-month period (July 2013 -June 2014). Red dashed line is the median flow recorded for the period of 350 l/s.

Figure 15 shows that generally the summer flow pattern for Cluden Stream is characterised by stable flows with very few flushes. From June to the start of November Cluden Stream has higher sustained flows due to rain and snow melt.

10.1. Instream Ecology

Schedule 1A of the Regional Plan: Water for Otago makes no mention of significant ecosystem values being present in Cluden Stream (ORC, 2016).

A search of NIWA's Freshwater Fish Database for the Cluden catchment shows brown trout, rainbow trout, upland bully, koaro, longfin eel and Clutha flathead galaxiids as being present (Figure 16).

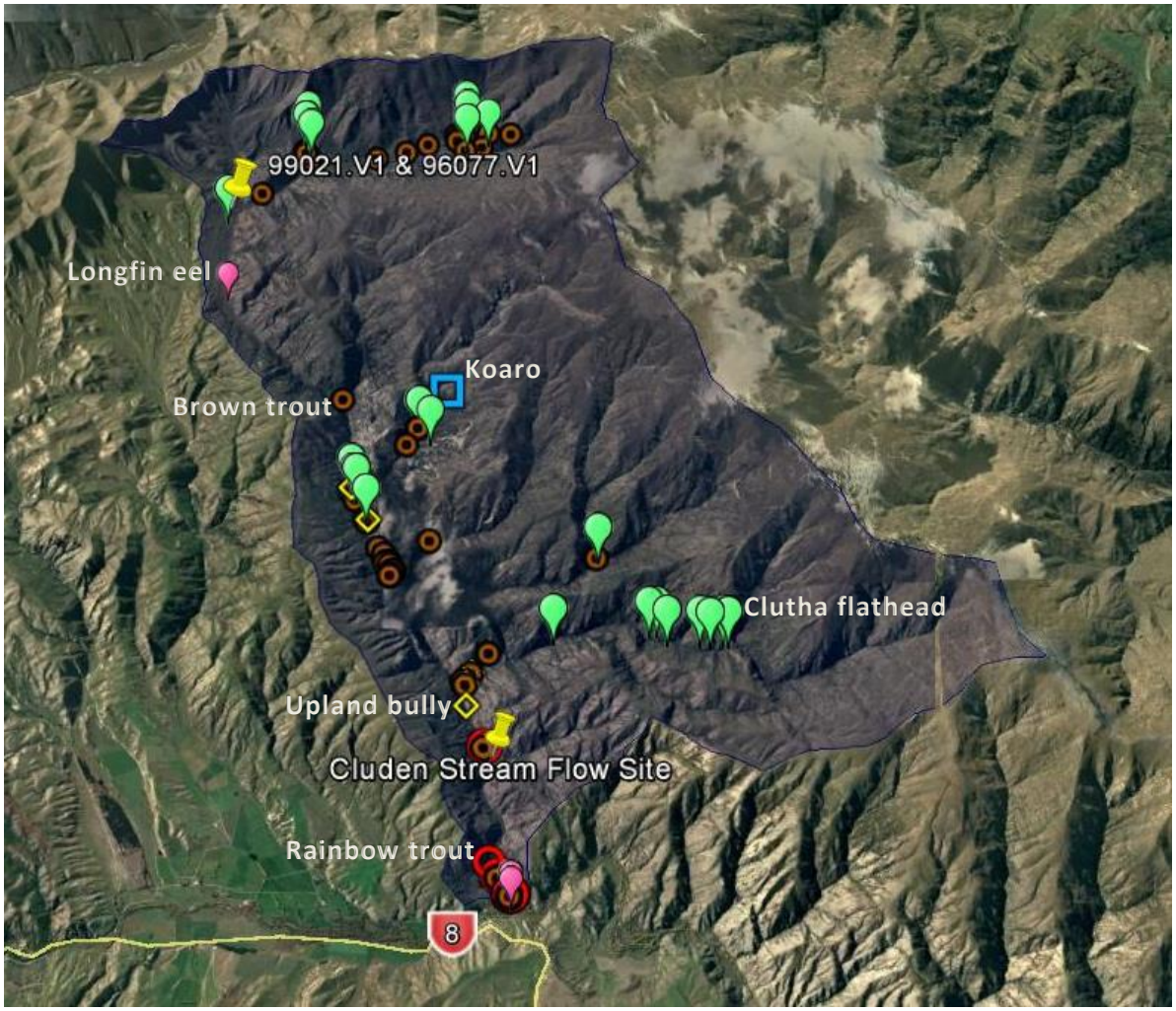


Figure 16. Fish Distribution Map for Cluden Stream from the NIWA FWFDB in July 2017.

Brown trout are the most widely distributed fish occurring throughout the catchment, in many cases in good numbers. Clutha flathead galaxiids tend to be confined to the upper reaches of Cluden Stream and some of its tributaries. Upland bullies appear to occur in the Cluden Stream mainstem between the existing take and the confluence with the Lindis River. Rainbow trout have been recorded in the bottom 3 – 4 km of the catchment (Figure 16).

10.2. Residual Flow Discussion

Historically no residual flow has been left at the point of take during summer, except during freshes. Due to the contribution of tributaries below this point flows quickly increase, and over the last 5 years there has always been a flow of 0.086 – 0.120 m^3/s during the height of summer in the lower Cluden Stream.

The 7-day MALF at the take location is estimated to be ~0.030 m^3/s based on catchment area yields and measured flows in Coal Creek which are mostly augmented from Cluden Stream during summer.

Cluden Stream has long been recognised for its trout spawning and rearing values. The historic flow regime appears to have maintained the significant trout spawning and rearing values in the lower Cluden Stream.

The applicant proposes to maintain a residual flow of 0.005 m^3/s below the take to ensure the existing values of Cluden Stream are maintained and to provide for surface flow connection.

10.3. Summary

- Cluden Stream at the flow recorder (well downstream of the existing take) has a 7-day MALF of 0.103 m^3/s based on 5 years of data.
- The lower reaches of Cluden Stream are of high value for trout spawning and rearing.
- Six species of fish (brown trout, upland bully, koaro, upland bully, longfin eel and Clutha flathead galaxiids) have been recorded in Cluden Stream both above and below the existing point of take.
- A residual flow of 0.005 m^3/s is recommended to maintain surface flow connection at all times.

11. Coal Creek

Coal Creek is a small tributary (38 km^2) entering the Lindis River on the true left downstream of the Lindis Peak flow site. There is four hydrological years of data available for Coal Creek upstream of the only water take from the creek, however this flow is augmented from a take from Cluden Stream that is discharged to the upper reaches of Coal Creek (Figure 17).

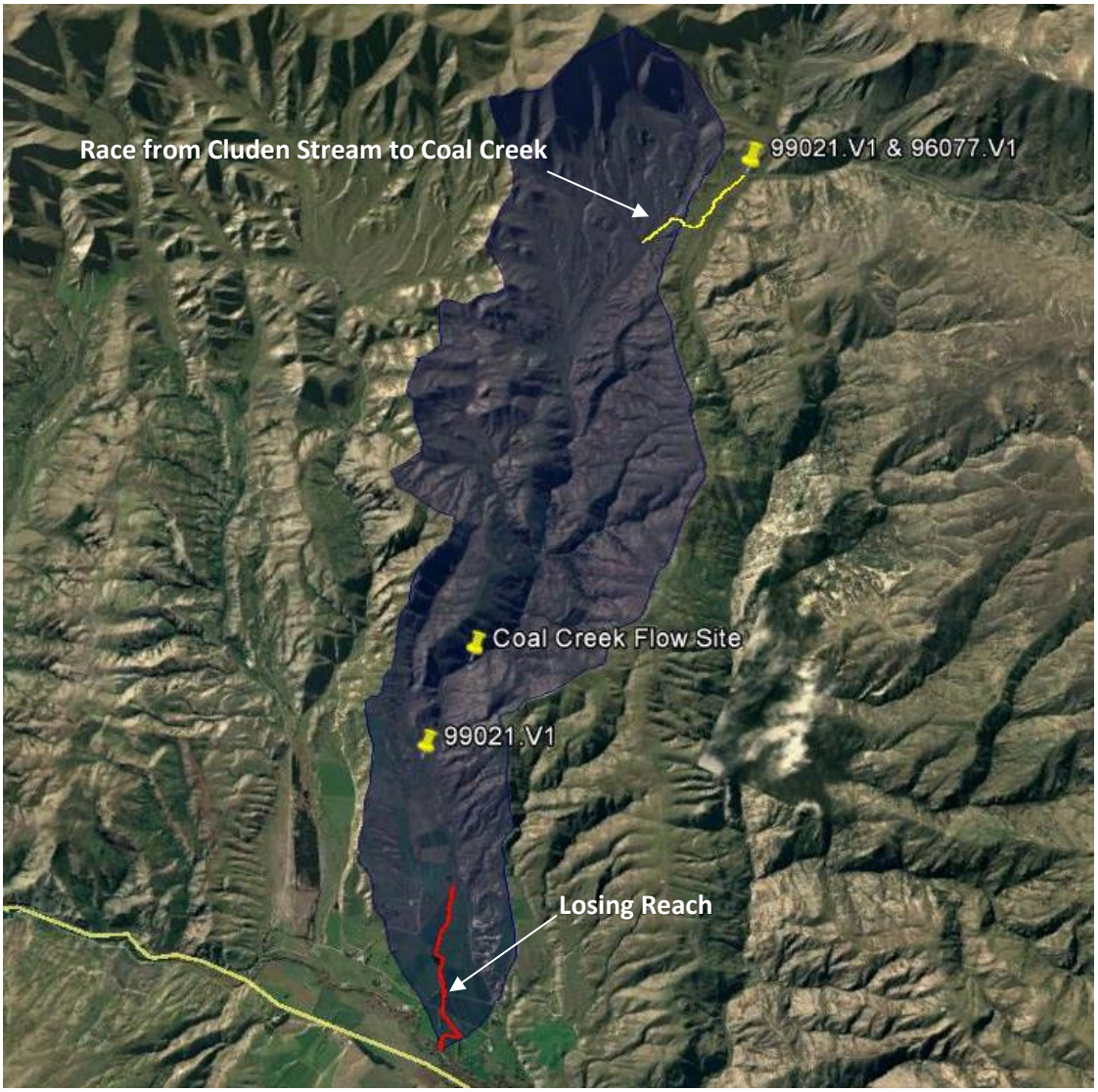


Figure 17. Map showing the Coal Creek catchment, ORC's temporary flow site, the losing reach (in red) and the current take from Cluden Stream via race to Coal Creek (in yellow) and subsequent abstraction point from lower Coal Creek (99021.V1).

Flows recorded in Coal Creek are augmented from a diversion from Cluden Stream. There is no measuring device on the take from Cluden Stream as it was issued an exemption by ORC due to its remoteness. The 7-day MALF for Cluden Stream at the point of take has been estimated at ~0.030m^3/s, based on catchment area yields for Cluden Stream and measured low flows in Coal

Creek. Historically during summer there has been no residual flow left to pass the diversion from Cluden Stream. Therefore, it is fair to assume that the first 0.030m^3/s recorded in Coal Creek is likely to be sourced from Cluden Stream. As flows recorded in Coal Creek are often less than 0.030m^3/s then it is fair to assume that Coal Creek would be naturally ephemeral without the influence of Cluden Stream.

Table 4 below provides basic flows statistics for Coal Creek; it shows that it always carries a good flow of water most likely due to the augmentation of flows from Cluden Stream.

Table 4:Recorded Daily Average Flows for Coal Creek from November 2012 – June 2016.

Season	Min (m^3/s)	Median (m^3/s)	Mean (m^3/s)	Max (m^3/s)	7-day Min (m^3/s)
12/13	0.039	0.086	0.155	1.089	0.041
13/14	0.027	0.075	0.153	2.954	0.027
14/15	0.024	0.13	0.167	1.337	0.026
15/16	0.018	0.043	0.066	0.397	0.018

Figure 18 below provides a graph of the 13/14 hydrological year to understand the natural flow pattern on an annual time scale.

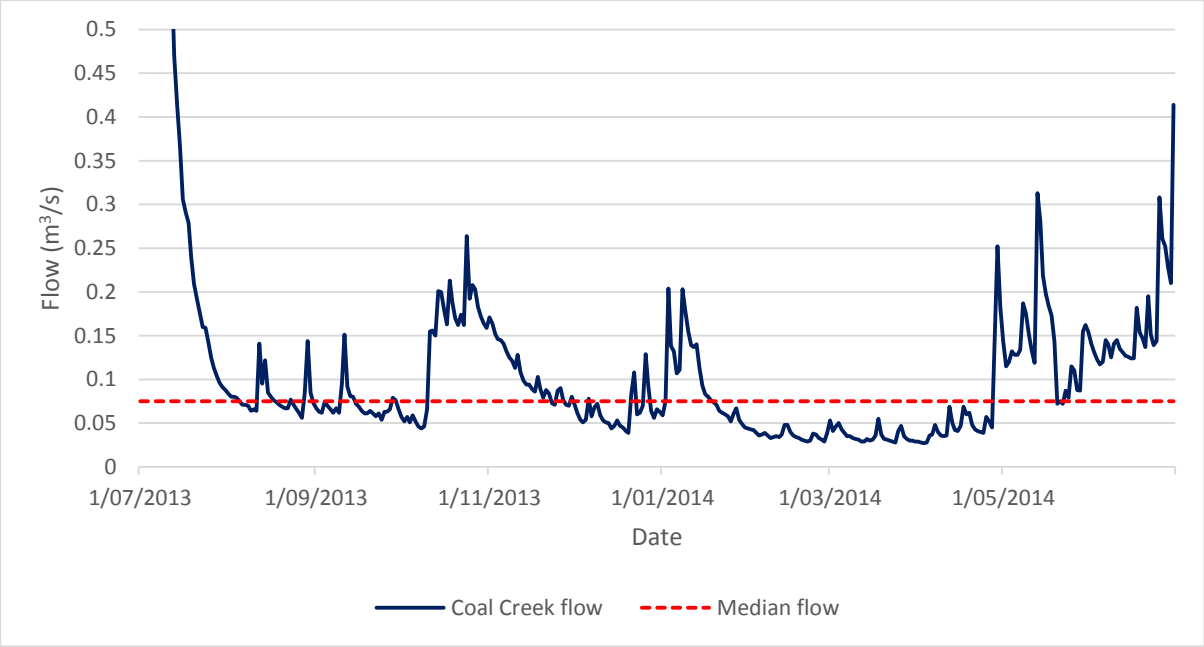


Figure 18 Recorded daily flows for Coal Creek for a 12-month period (July 2013 -June 2014). Red dashed line is the median flow recorded for the period of 0.075m^3/s.

Figure 18 shows that generally Coal Creek has more flow variability than the other Lindis tributaries, most probably because of the addition of Cluden Stream flows.

11.1. Instream Ecology

Schedule 1A of the Regional Plan: Water for Otago makes no mention of significant ecosystem values being present in Coal Creek (ORC, 2016).

A search of NIWA's Freshwater Fish Database for Coal Creek contains 50 records with brown trout, upland bully and Clutha flathead galaxiid being listed as present (Figure 19). The majority of fish occur upstream of the existing take in the reach augmented by water from Cluden Stream.

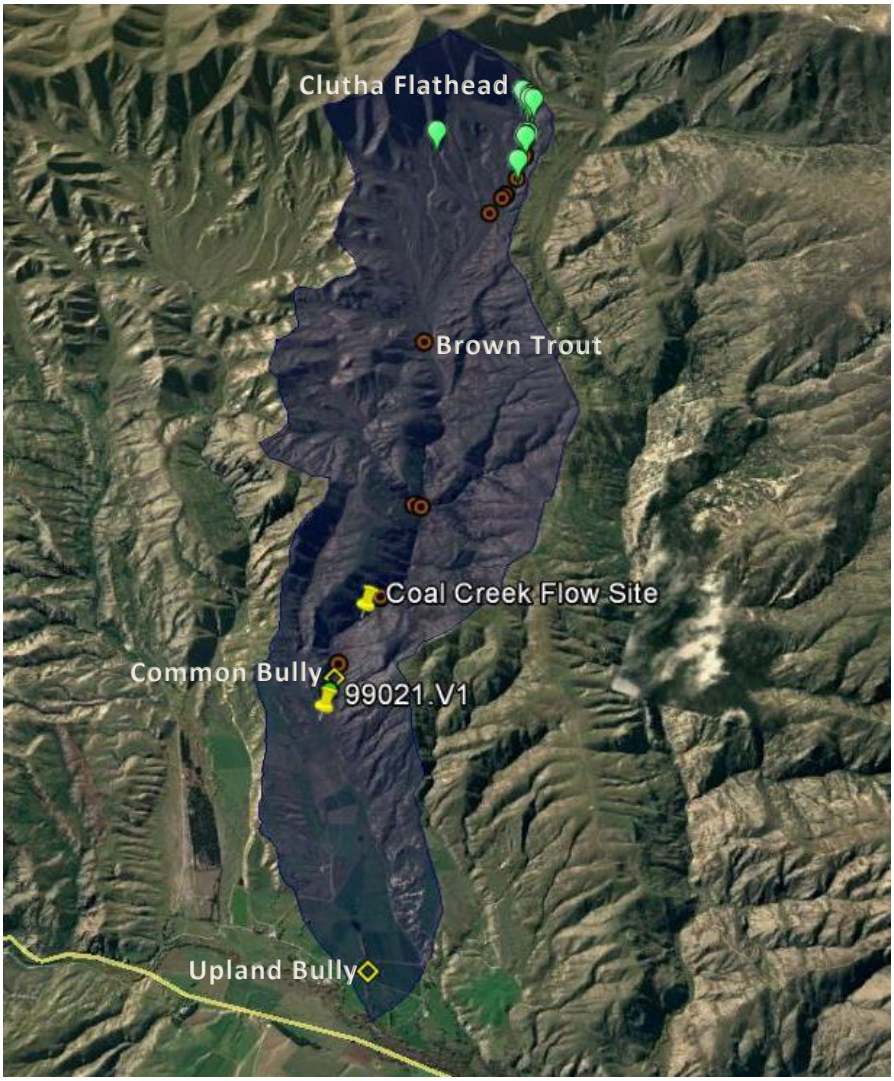


Figure 19. Fish Distribution Map for Coal Creek from the NIWA FWFDB in July 2017.

11.2. Residual Flow Discussion

Coal Creek would dry naturally whether abstraction occurs or not. Flows are augmented from Cluden Stream which significantly increase flows above what would naturally occur. In dry seasons, even with augmentation, the lower reaches of Coal Creek can be dry due to losses to groundwater.

Given the lower reaches of Coal Creek dry naturally, similarly to the neighbouring Tim Burn, there would be no benefit in setting a residual flow that maintains surface flows for ecological reasons in the lower reaches of Coal Creek.

11.3. Summary

- Flows in Coal Creek generally exceed 0.020 m^3/s due to augmentation from Cluden Stream.
- Coal Creek would naturally dry without augmentation from Cluden Stream.
- Clutha flathead galaxiids occur in the upper reaches of Coal Creek and are unaffected by the take.

- The lower reaches of Coal Creek (below the ORC recorder) are alluvial by nature and losses to ground means lower Coal Creek dries naturally. Coal Creek has been observed dry on occasion by the landowner, even with augmentation from Cluden Stream.
- No residual flow is recommended as it would add no ecological benefit as Coal Creek dries naturally.

12. The Tim Burn

The Tim Burn is a small tributary with a total catchment area of 59 km^2 entering the Lindis River on the true left downstream of the Lindis Peak flow site (Figure 20).

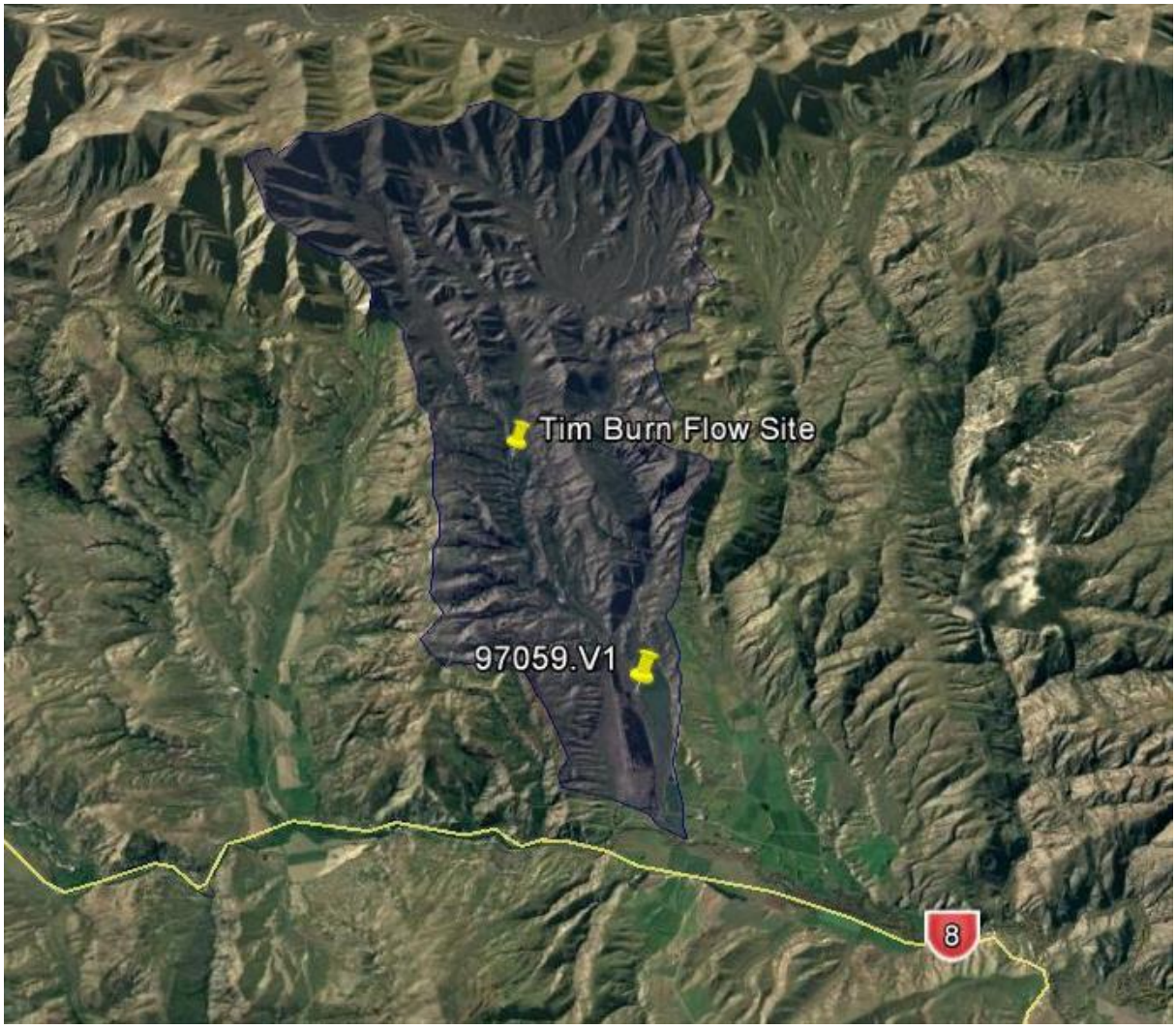


Figure 20. Map showing the Tim Burn catchment with the existing take location for 97059.V1 and ORC's Tim Burn flow site.

There are four hydrological years of data available for the Tim Burn North Branch upstream of the only water take from the stream. The North Branch of the Tim Burn yields significantly more water than the South Branch. Each summer the South Branch is dry before reaching its confluence with the North Branch, thus the recorded natural 7-day MALF on the North Branch is likely to be a fair estimate of what would be expected at the take location. Figure 21 shows recorded flows at ORC's Tim Burn North Branch flow site plotted against actual take data for Consent 97059.V1 for the months of February and March 2015. During this period consent 97059.V1 was taking all the water

available, which was very similar to the flows recorded upstream, supporting the observations that the majority of flow in the Tim Burn is from the North Branch.

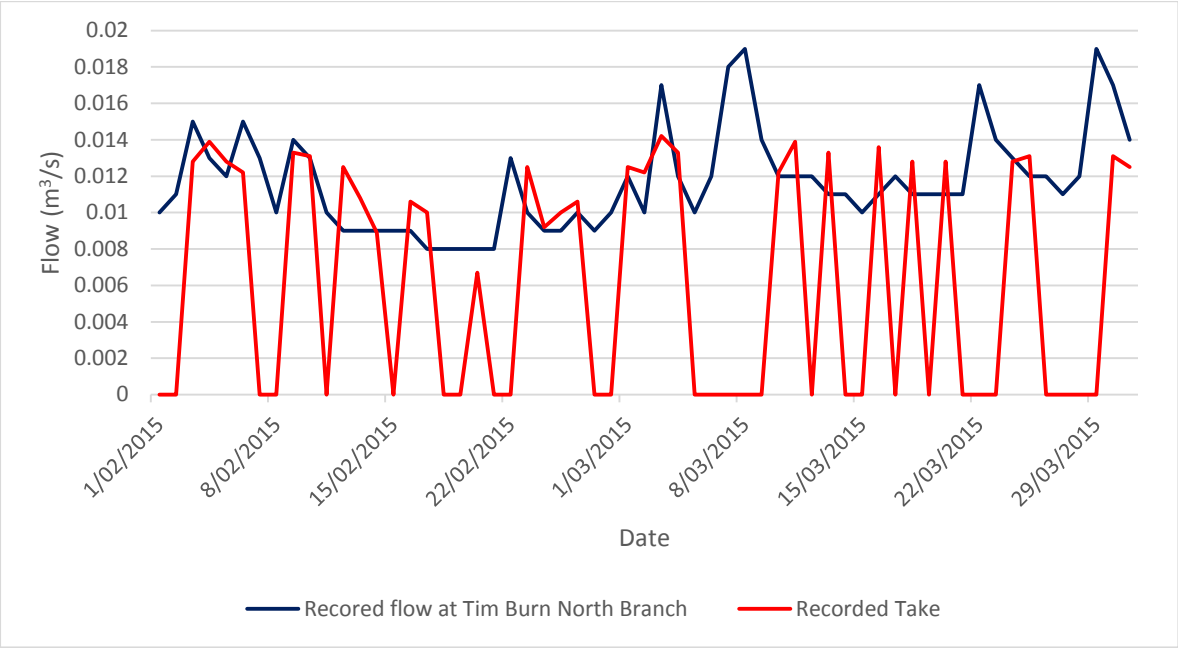


Figure 21. Recorded flow from the Tim Burn North Branch Vs recorded actual take from the Tim Burn under consent 97059.V1 for February and March 2015.

Historically the Tim Burn rarely flows in its lower reaches even when abstraction is not occurring due to losses to groundwater (Figure 22).

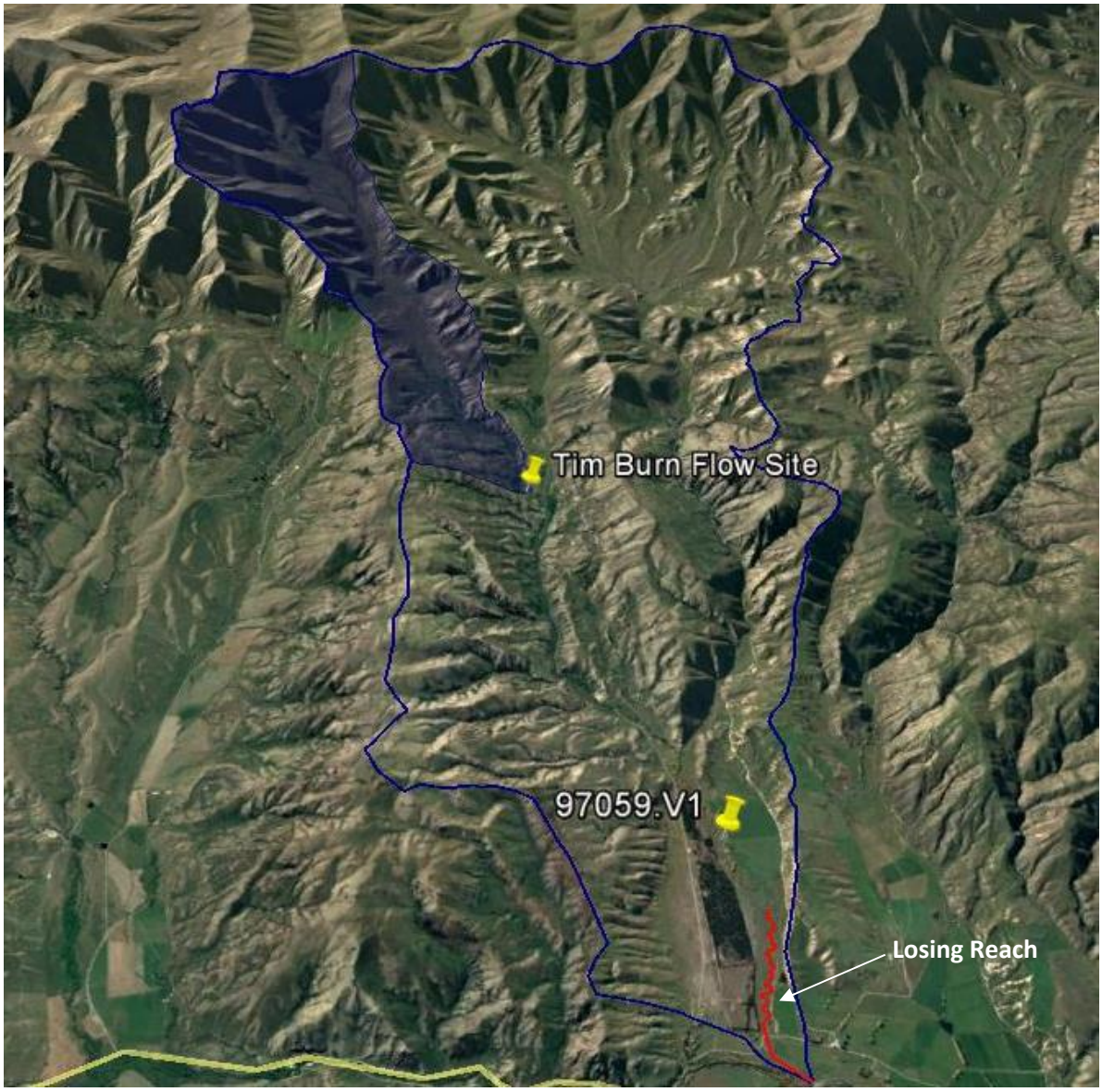


Figure 22. Map showing catchment area above ORC's temporary flow site in the Tim Burn, the current abstraction point for consent 97059.V1 and the "lower Tim Burn losing reach".

Photos taken at the Tim Burn losing reach in June and July 2017 when no water was being abstracted, show that with an estimated flow of 20 -30 l/s at the take location there was not enough water to provide a continuous flow to the Lindis River (Figure 23 and Figure 24).

Figure 23. Tim Burn looking upstream and downstream of the Timburn Rd Bridge on the 30th of June 2017.

Figure 24. Tim Burn looking upstream and downstream of the Timburn Rd Bridge on the 17th of July 2017.

Table 5 below provides basic flow statistics for the entire data record for the Tim Burn; it shows that the Tim Burn is dominated by low stable flows, with flows generally less than 40 l/s much of the time.

Table 5: Daily Average Natural Flows for the Tim Burn Recorded During November 2012 – June 2016.

Season	Min (m^3/s)	Median (m^3/s)	Mean (m^3/s)	Max (m^3/s)	7-day Min (m^3/s)
12/13	0.006	0.021	0.034	0.55	0.006
13/14	0.008	0.034	0.056	1.16	0.009
14/15	0.007	0.036	0.049	0.326	0.008
15/16	0.004	0.019	0.037	0.183	0.005

Figure 25 below provides a graph of the 13/14 hydrological year to understand the natural flow pattern on an annual time scale.

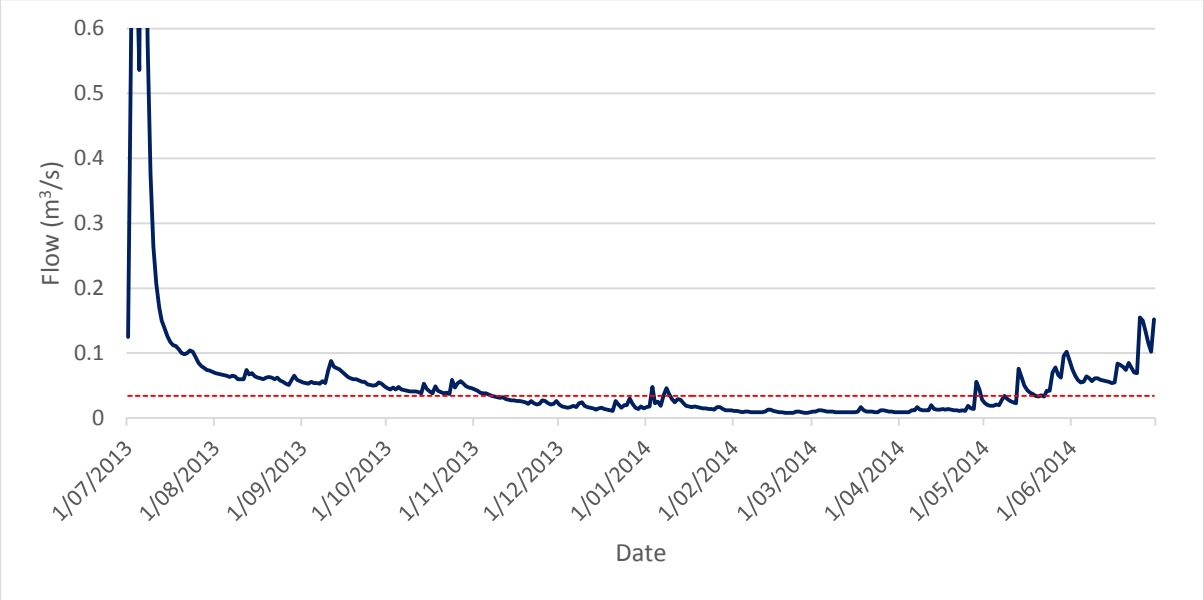


Figure 25. Natural daily flows for the Tim Burn a 12-month period (July 2013 -June 2014). Red dashed line is the median flow recorded for the period of 34 l/s.

Figure 25 shows that generally the summer flow pattern for the Tim Burn is characterised by low flows with very few flushes. From June to the start of November the Tim Burn has higher sustained flows due to rain and snow melt.

12.1. Instream Ecology

Schedule 1A of the Regional Plan: Water for Otago makes no mention of significant ecosystem values being present in the Tim Burn (ORC, 2016).

A search of NIWA's Freshwater Fish Database for the Tim Burn catchment shows 19 records with brown trout, upland bully and Clutha flathead galaxiids being recorded (Figure 26). All fish records are from the perennial reaches of the Tim Burn upstream of the existing take.

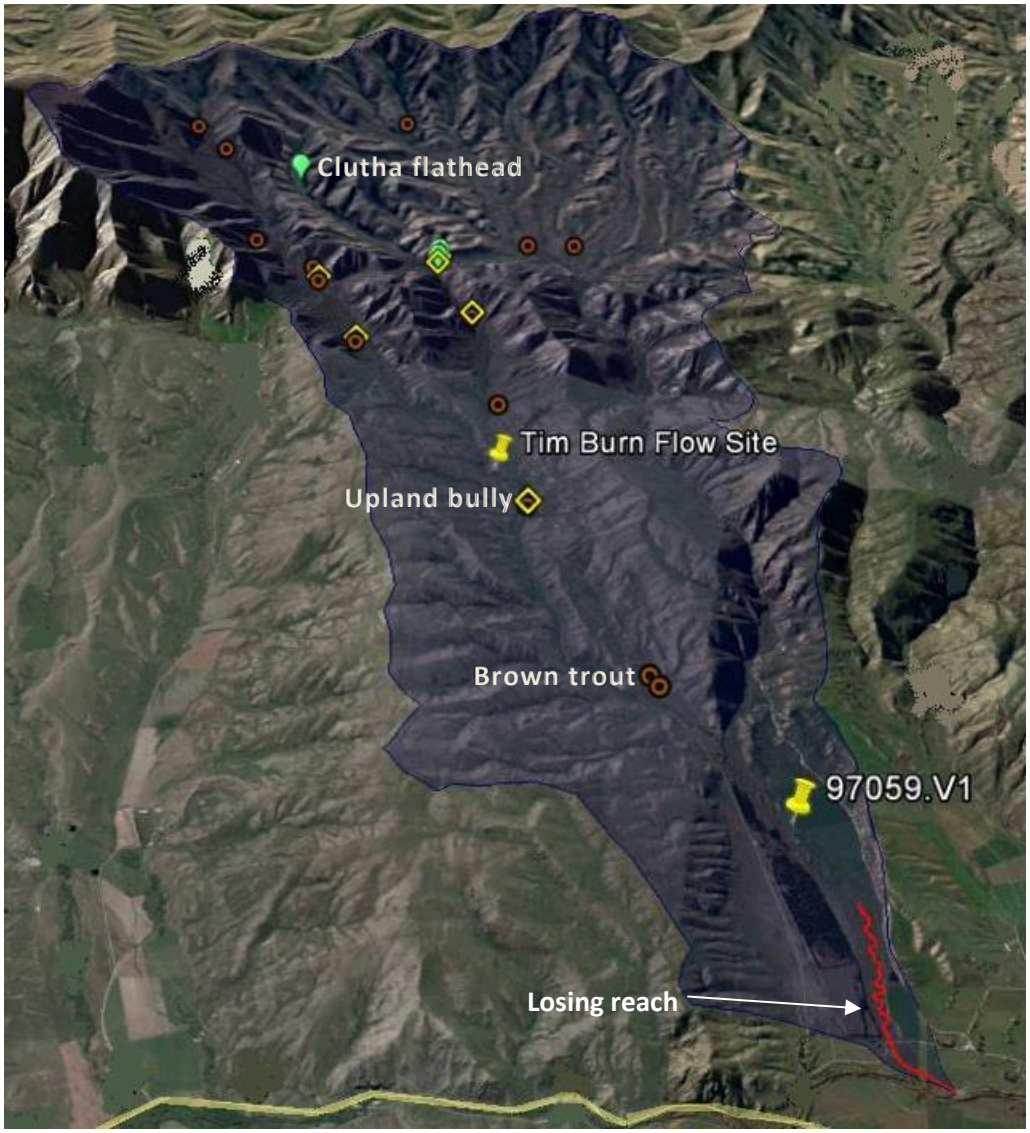


Figure 26. Fish Distribution Map for the Tim Burn from the NIWA FWFDB in July 2017.

12.2. Residual Flow Discussion

The combination of very low natural summer flows and a losing reach in the lower Tim Burn means it would dry whether abstraction occurs or not below the existing take (Figure 22). Observations by the landowner suggest that even with no abstraction and with flows greater than the 7-day MALF, surface flow does not occur at the Timburn Road bridge immediately above the Tim Burn's confluence with the Lindis River (Figure 23 and Figure 24). Further to this, in very dry seasons the Tim Burn can also be dry at the applicants take location.

Electric fishing surveys have identified three species of fish in the Tim Burn all occurring in the permanently flowing reaches above the take.

Given the lower reaches of the Tim Burn dry naturally, probably in excess of 50% of the time there would be no benefit in setting a residual flow that maintains surface flows for ecological reasons in the lower reaches of the Tim Burn.

12.3. Summary

- The Tim Burn naturally experiences low summer flows (less than 0.010 m^3/s).
- Due to losses to ground the Tim Burn naturally dries up in its lower reaches.
- Three species of fish (brown trout, upland bully and Clutha flathead galaxiids) have been recorded in the permanently flowing reaches above the point of take.
- No residual flow is recommended as it would add no ecological benefit as the Tim Burn dries naturally immediately below the point of take.

13. Eight and Nine Mile Creeks

Both Eight and Nine Mile Creeks enter the Lindis River on the true right in its mid-reaches. There is one take from each creek (Figure 27).

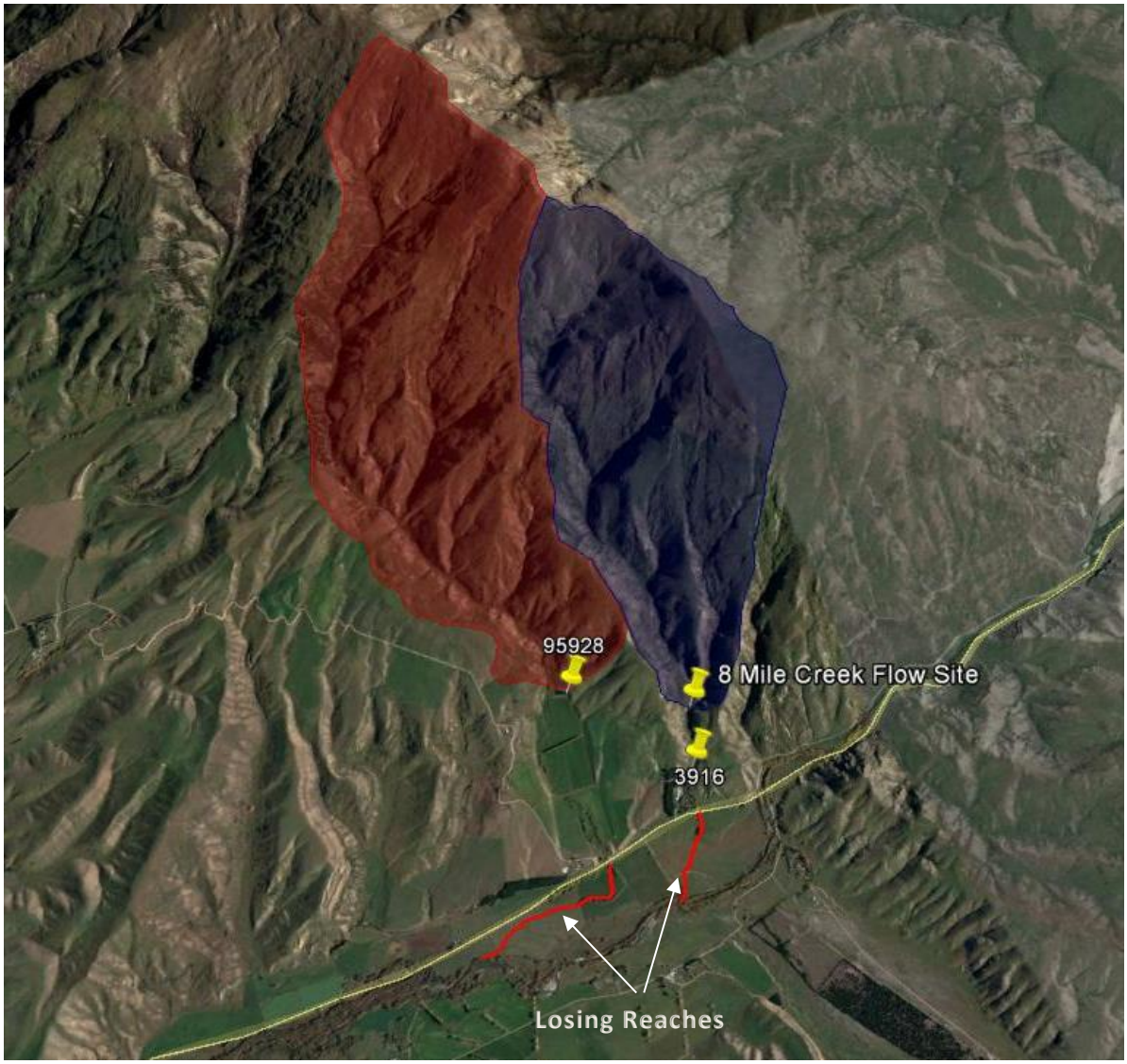


Figure 27. Map showing the Eight Mile Creek catchment area (shaded blue) above ORC's temporary flow site, the Nine Mile Creek Catchment (shaded red) and the losing reaches in the lower catchment.

Both Eight and Nine Mile Creeks are relatively small tributaries of the Lindis with summer flows under 10 l/s common (Figure 28).

Figure 28. Nine Mile Creek (left photo) and Eight Mile Creek (Right photo) upstream of the existing takes.

Nine Mile Creek doesn't have any flow information. However, Eight Mile Creek has a flow site where natural flows are recorded. This data can be used to create a synthetic flow record for Nine Mile Creek by adjusting Eight Mile Creeks naturalised flow record based on catchment size. The catchment area above the Eight Mile Creek flow site is 5.5 km^2 and the catchment area of Nine Mile Creek above the existing take is 8.2 km^2 (Figure 27).

Table 6 below provides basic flows statistics for flow recorded for Eight Mile Creek; it shows that Eight Mile Creek is a very small stream dominated by very low stable flows, with flows generally less than ~0.015 m^3/s much of the time.

Table 6: Recorded Daily Average Natural Flows for Eight Mile Creek.

Season	Min (m^3/s)	Median (m^3/s)	Mean (m^3/s)	Max (m^3/s)	7-day Min (m^3/s)
12/13	0.003	0.009	0.013	0.112	0.003
13/14	0.004	0.014	0.025	0.359	0.004
14/15[#]	0.006	0.026	0.046	0.387	0.007
15/16	0.008	0.016	0.032	0.151	0.008

[#] flow data missing for the period 17/10/2014 – 25/03/2015 when the lowest flows are likely to occur.

Table 7 below provides basic flows statistics for flow recorded for Nine Mile Creek, it shows that Nine Mile Creek is also a very small stream dominated by very low stable flows, with a natural 7-day MALF of ~0.008 m^3/s.

Table 7: Synthetic Daily Average Natural Flows for the Nine Mile Creek based on Recorded Flows from Eight Mile Creek.

Season	Min (m^3/s)	Median (m^3/s)	Mean (m^3/s)	Max (m^3/s)	7-day Min (m^3/s)
12/13	0.004	0.013	0.019	0.166	0.004
13/14	0.006	0.021	0.036	0.531	0.006
14/15[#]	0.009	0.038	0.068	0.573	0.010
15/16	0.012	0.024	0.047	0.223	0.012

[#] flow data missing for the period 17/10/2014 – 25/03/2015 when the lowest flows are likely to occur.

Figure 29 below provides a graph of the 13/14 hydrological year for recorded flows in Eight Mile Creek (Nine Mile Creek would follow a similar pattern), to understand the natural flow pattern on an annual time scale.

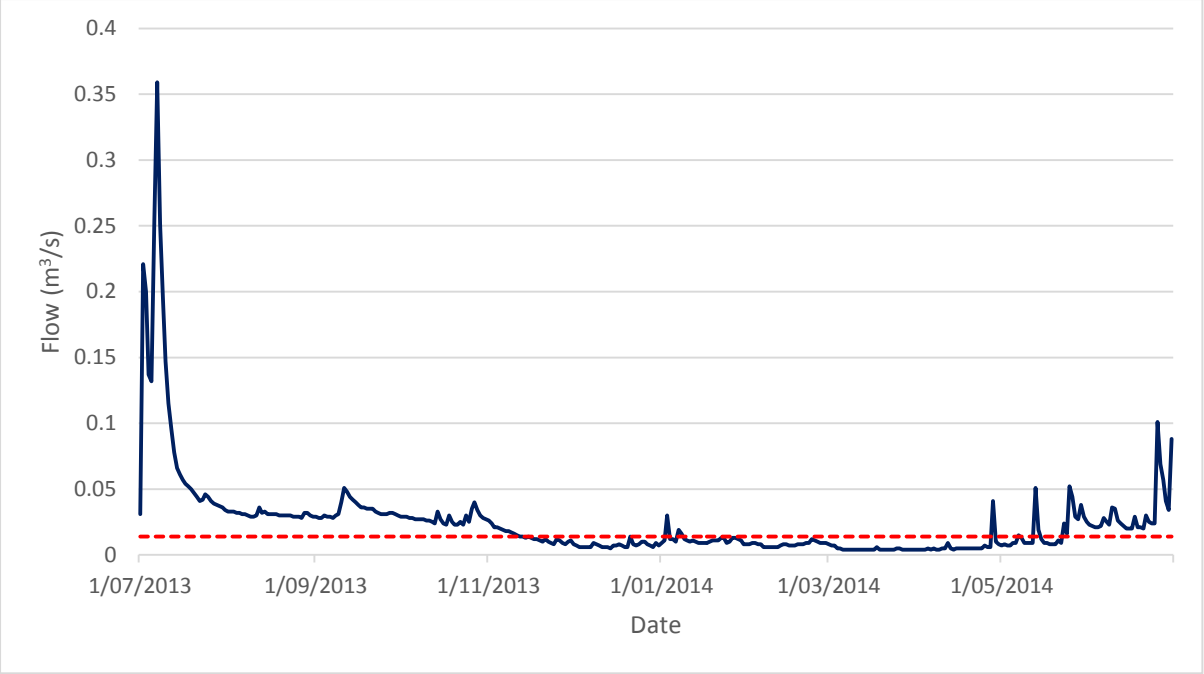


Figure 29. Natural daily flows for Eight Mile Creek over a 12-month period (July 2013 -June 2014). Red dashed line is the median flow recorded for the period of 14 l/s.

Figure 29 shows that generally the summer flow pattern for Eight Mile Creek (and Nine Mile Creek) is characterised by very low flows with very few flushes. From June to the start of November Eight Mile Creek has higher sustained flows due to rain and snow melt.

Observations from the landowner indicates that both Eight and Nine Mile Creeks flow at all times above the existing takes, however the lower reaches (between the SH8 Bridge and Lindis confluence) can be dry even with relatively good flows further upstream (Figure 27).

13.1. Instream Ecology

Schedule 1A of the Regional Plan: Water for Otago makes no mention of significant ecosystem values being present in either Eight or Nine Mile Creeks (ORC, 2016).

A search of NIWA's Freshwater Fish Database shows no fish records for Eight Mile Creek. There is one fish record for Nine Mile Creek which lists brown trout as common.

13.2. Residual Flow Discussion

Both Eight and Nine Mile Creeks are very small as would be expected with catchment areas of just 8 and 5 km^2 respectively. One take is present from each creek in the lower catchments immediately above where flow is naturally lost to ground. Nine Mile creek has brown trout present in relatively good numbers in the perennial reach upstream of the existing take.

Eight Mile Creek has no fish records on the NIWA freshwater fish database, however any fish population in this stream is likely to occur in the perennial reach upstream of the take as is the case in Nine Mile Creek. As the lower reaches of Eight Mile Creek dry naturally due to the combination of natural low flows and losses to ground, a residual flow is unlikely to provide any meaningful benefit to instream values. Because the existing take is located at the downstream end of the perennial reach it has little effect on the section of the creek that carries permanent flows that would potentially support fish.

Given the lower reaches of both Eight and Nine Mile Creeks dry naturally, there would be no benefit in setting a residual flow that maintains surface flows for ecological reasons in the lower reaches of either creek.

13.3. Summary

- Both Eight and Nine Mile Creeks experience naturally very low summer flows (less than 0.010 m^3/s).
- Observations by the landowner are that flows generally don't connect with the Lindis River, except at higher flows. This is because of the alluvial plain the two creeks cross to reach the Lindis River where flows are lost to ground.
- Brown trout occupy the perennial reaches of Nine Mile Creek above the take.
- No residual flows are recommended for Eight and Nine Mile Creeks to protect the ecological values, as the streams dry naturally in the lower reaches below the takes.

14. Long Spur Creek

Long Spur Creek is a tributary of the Lindis River. The only take from the creek is located in the lower reaches above the confluence with Rocky Creek (Figure 30).

Figure 30. Map showing the Long Spur Creek catchment, ORC's temporary flow site on Rocky Creek, the current abstraction point and the losing reach in the lower catchment.

Long Spur Creek doesn't have any flow information and observations by the landholder suggest that yields from Long Spur Creek are significantly less than Rocky Creek on a catchment area basis. All the water taken from both consents 96637.V2 (Long Spur Creek) and 96638.V2 (Rocky Creek) are recorded through the same meter. The landholder says that all flow is taken at both takes in the height of summer. Therefore, as Rocky Creek is immediately above take 96638.V2 the difference in flows recorded on Rocky Creek and the water recorded as taken during the middle of summer can be assumed to be the natural flow at the Long Spur take point.

Figure 31 shows flows recorded at the ORC's Rocky Creek flow site which is located immediately above take 96637.V2 and the total take recorded for both consents 96637.V2 and 96638.V2. It shows that Long Spur Creek yields about half of the flow that Rocky Creek does in the middle of summer.

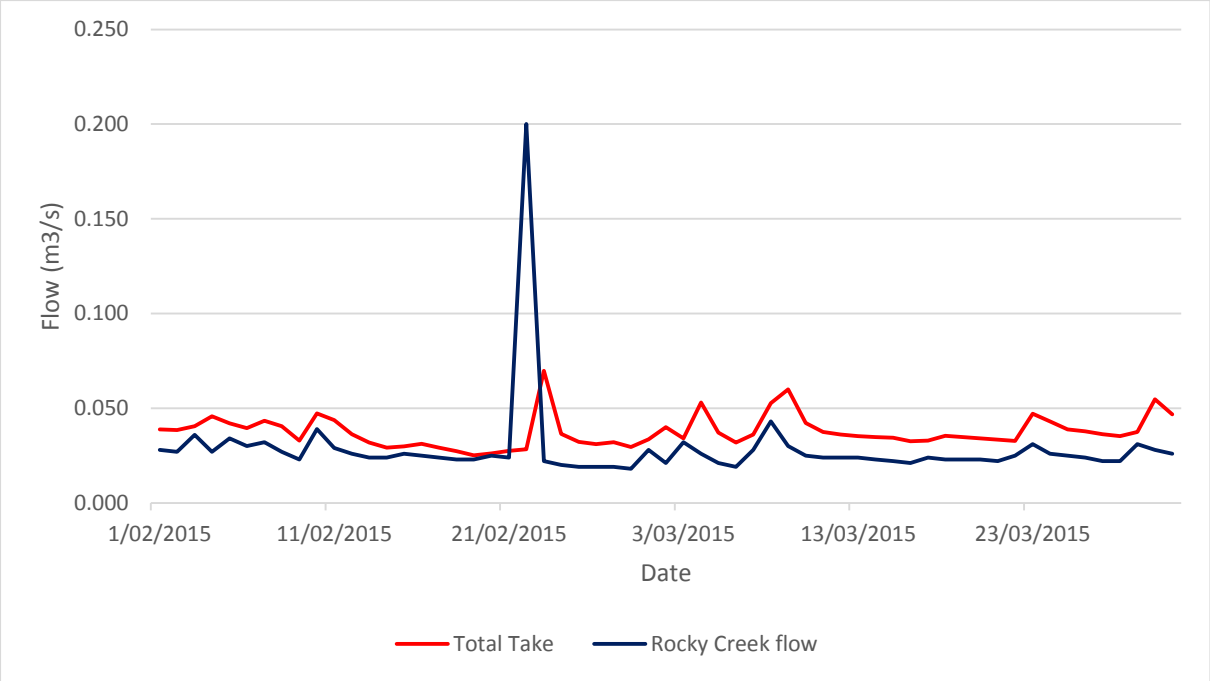


Figure 31. Comparison of recorded flow at Rocky Creek (above takes) and total recorded take for both consents 96637.V2 and 96638.V2. The difference between the blue and red lines is the natural flow at the take point for 96637.V2 as neither take historically leaves a residual flow in summer.

Table 8 below provides basic low flow statistics for Long Spur Creek at the existing take based on them being half of what was measured at Rocky Creek; it shows that Long Spur Creek is dominated by low flows, generally less than 0.012 m^3/s.

Table 8: Daily average natural low flows for Long Spur Creek based on recorded flows from Rocky Creek During November 2012 – June 2016.

Season	Min (m^3/s)	7-day Min (m^3/s)
12/13	0.016	0.017
13/14	0.012	0.012
14/15	0.009	0.010
15/16	0.008	0.008

Observations from the landowner indicate that Long Spur Creek loses flow to groundwater downstream of the Rocky Creek confluence, culminating in a naturally dry reach approximately 500m downstream of the confluence. However, the reach immediately above the Lindis River confluence (in the vicinity of the SH8 Bridge) flows at all times due to gains from groundwater.

On the 17th of April 2016, the landowner took photos of the lower reaches of Long Spur Creek. No water had been taken upstream since the 13th of April. The daily average flow on the 17th at the Rocky Creek flow site was 0.023 m^3/s and the estimated flow at the ford is ~35 l/s (Figure 32). The natural 7-Day minimum for Long Spur Creek below the Rocky Creek confluence for the 15/16 irrigation season was less than 0.025 m^3/s. The natural 7-day MALF below the Rocky Creek confluence for four complete years is 0.034 m^3/s. These observations and flow figures confirm that the lower reaches of Long Spur Creek naturally dry on an annual basis.

Figure 32. Losing reach in Long Spur Creek below the confluence of Rocky Creek, and photos by the landowner corresponding to the different flowing (shown in blue) and dry reaches (shown in red).

14.1. Instream Ecology

Schedule 1A of the Regional Plan: Water for Otago makes no mention of significant ecosystem values being present in Long Spur Creek (ORC, 2016).

A search of NIWA's Freshwater Fish Database for Long Spur Creek contains seven records upstream of the existing take with brown trout the only species recorded. A further three records are from downstream of the existing take with brown trout, upland bully and longfin eel listed as present (Figure 33).

The only records of native fish in Long Spur Creek are in the reach immediately above Long Spur Creeks confluence with the Lindis where both upland bully and eel were recorded in 1988. However due to the effects of Roxburgh and Clyde Dams on the Clutha River it is possible that eels are no longer present.

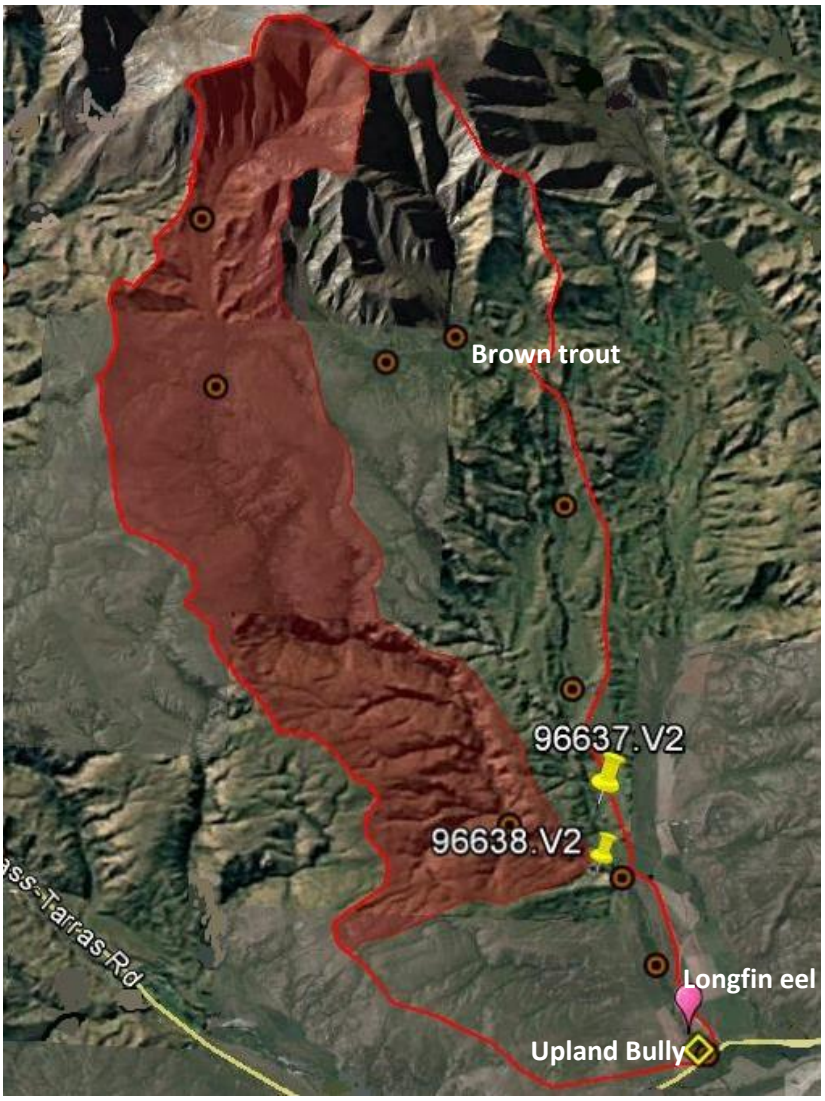


Figure 33. Fish Distribution in the Long Spur Creek catchment with the Rocky Creek sub-catchment shaded red. Also shown are the existing water takes from the catchment (96637.V2 and 96638.V2).

14.2. Residual Flow Discussion

Although Long Spur Creek experiences naturally very low flows at the point of take (less than 0.015 m^3/s) it is unlikely that it would naturally dry at this point except in the most extreme seasons. Less than 1 Km downstream of the existing take a naturally losing reach has been identified; observations by the landowner suggest that flows in excess of 0.040 m^3/s are needed to maintain surface flows in this reach.

Electric fishing surveys indicate that brown trout are very abundant in Long Spur Creek under the existing water take and flow regime, both above the existing take and in the gaining reach around the SH8 Bridge. No native fish have been recorded in Long Spur Creek upstream of the existing take, but they have been recorded in the permanently flowing reach around the SH8 Bridge.

The location of the existing take means that the majority of Long Spur Creek is unaffected by the take. The naturally drying reach will likely be affected by the upstream water takes by increasing the duration of drying.

Long Spur Creek naturally dries downstream of the Rocky Creek confluence but always flows in the reach above the Lindis River confluence. Therefore there would be no benefit in setting a residual flow at the point of take that maintains surface flows for ecological reasons in the lower reaches of Long Spur Creek.

14.3. Summary

- Long Spur Creek at the existing take location naturally experiences low summer flows (less than 0.012 m^3/s).
- Long Spur Creek doesn't naturally dry at the take location but approximately 800m downstream of the existing take it is likely Long Spur Creek naturally goes dry due to losses to ground.
- The landowner estimates that flows greater than 0.040 m^3/s are needed to maintain surface connection through the losing reach in Long Spur Creek. This flow is higher than the natural low flows of Long Spur Creek and Rocky Creek combined, meaning it dries naturally.
- Long Spur Creek always has surface flow connected to the Lindis River due to groundwater gains, although it can be dry upstream.
- There are no records of native fish in Long Spur Creek upstream of the existing take.
- Brown trout are listed as abundant throughout Long Spur Creek, apart from the naturally drying reach.

15. Rocky Creek

Rocky Creek is a tributary of Long Spur Creek with a total catchment area of 23 km^2. The only take from the creek is located immediately below the ORC temporary flow site and immediately above the confluence with Long Spur Creek (Figure 34).

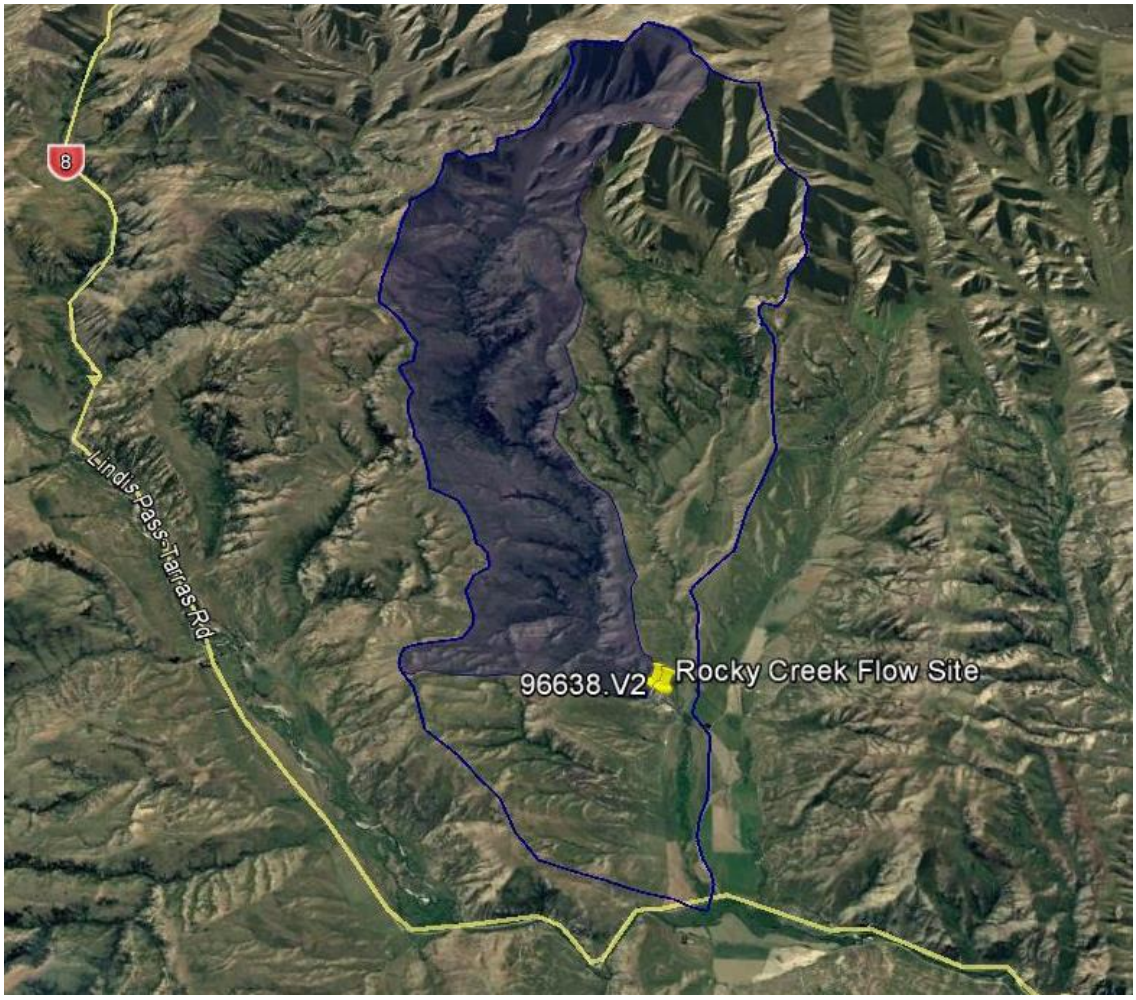


Figure 34. Map showing the Rocky Creek Catchment, ORC's temporary flow site and the current abstraction point.

There is four hydrological years of data available for Rocky Creek upstream of the only water take from the creek. Table 9 below summarises flow statistics for Rocky Creek.

Table 9: Daily Average Natural Flows for Rocky Creek Recorded During November 2012 – June 2016.

Season	Min (m^3/s)	Median (m^3/s)	Mean (m^3/s)	Max (m^3/s)	7-day Min (m^3/s)
12/13	0.032	0.063	0.106	0.876	0.033
13/14	0.023	0.084	0.155	2.135	0.023
14/15	0.018	0.078	0.123	0.866	0.021
15/16	0.015	0.044	0.080	0.381	0.015

Figure 35 below provides a graph of the 14/15 hydrological year to understand the natural flow pattern on an annual time scale.

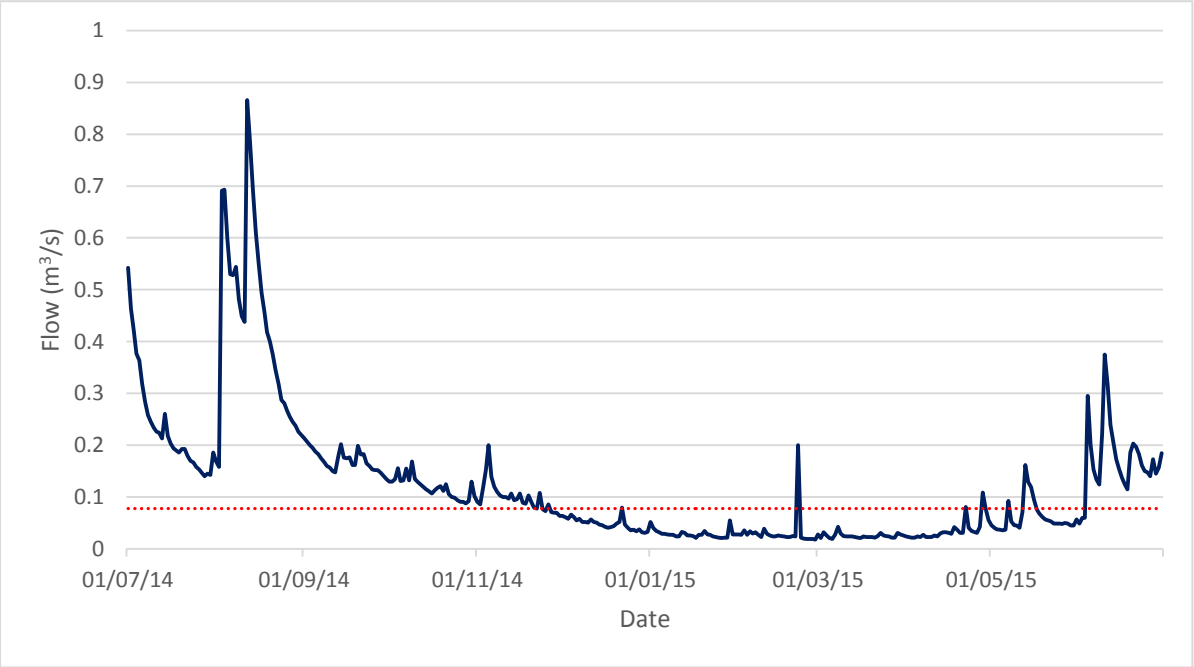


Figure 35. Natural daily flows for Rocky Creek over a 12-month period (July 2014 -June 2015). Red dashed line is the median flow recorded for the period of 0.078 m^3/s.

Figure 35 shows that generally the summer flow pattern for Rocky Creek is characterised by low flows with very few flushes. From June to the start of November Rocky Creek has higher sustained flows due to rain and snow melt.

15.1. Instream Ecology

Schedule 1A of the Regional Plan: Water for Otago makes no mention of significant ecosystem values being present in Rocky Creek (ORC, 2016).

A search of NIWA's Freshwater Fish Database for Rocky Creek contains three records, all of which list brown trout as abundant (Figure 36).

There are no records of any native fish species in Rocky Creek.

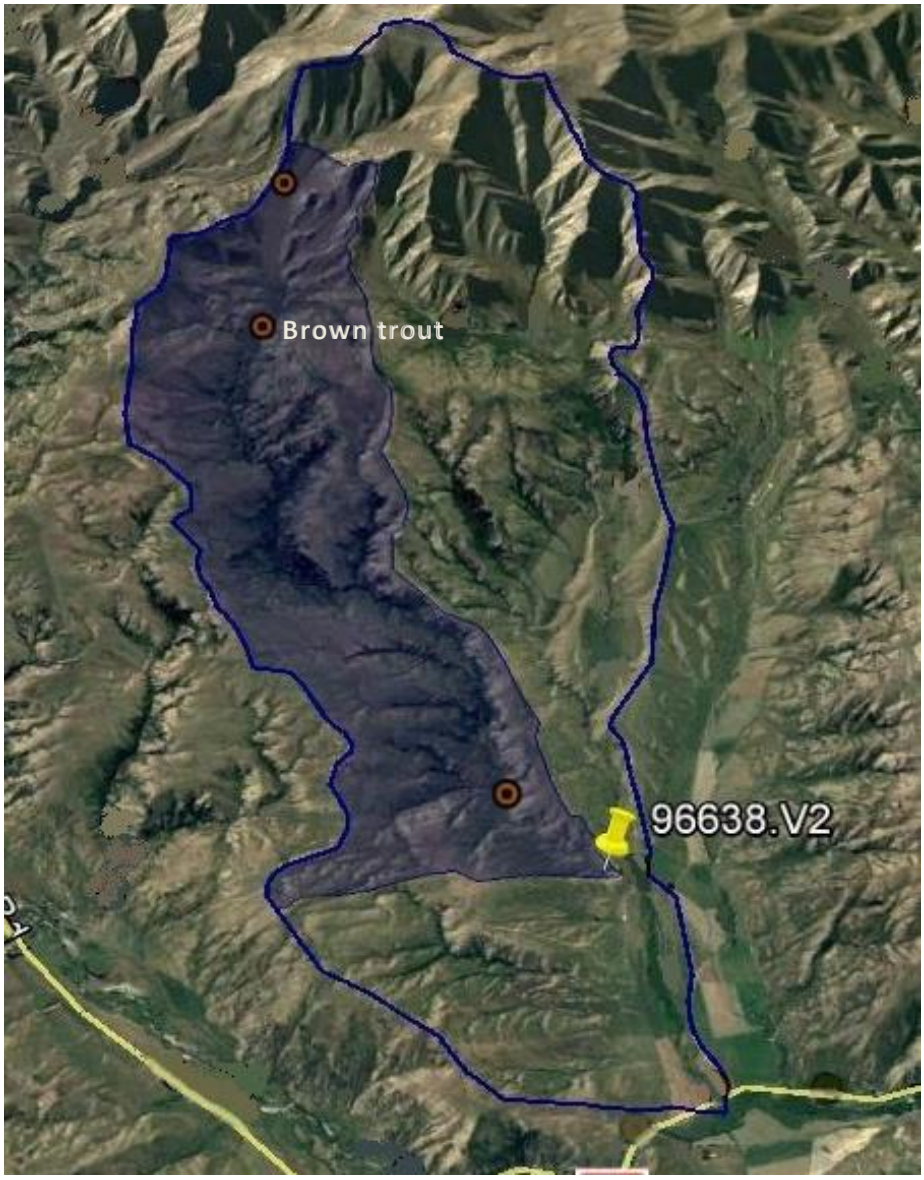


Figure 36. Fish Distribution Map for Rocky Creek (shaded sub-catchment of Long Spur Creek) from the NIWA FWFDB in July 2017.

15.2. Residual Flow Discussion

Although Rocky Creek experiences naturally very low flows it is unlikely that it would naturally dry except in the most extreme seasons.

Electric fishing surveys indicate brown trout are very abundant in Rocky Creek under the existing water take and flow regime. This is most likely because the location of the existing take means that the majority of Rocky Creek is unaffected by the take. No native fish have been recorded in Rocky Creek.

Given the existing take from Rocky Creek is from the bottom of the catchment, and immediately below its confluence Long Spur Creek naturally dries, there would be no benefit in setting a residual flow at the point of take that maintains surface flows for ecological reasons in the lower reaches of Rocky Creek.

15.3. Summary

- Rocky Creek naturally experiences low summer flows (less than 0.020 m^3/s).
- Rocky Creek doesn't naturally dry, but immediately downstream of its confluence Long Spur Creek dries due to losses to gravel.
- The landowner estimates that flows greater than 0.040 m^3/s are needed to maintain surface connection through the losing reach in Long Spur Creek. This flow is higher than the natural low flows of Long Spur Creek and Rocky Creek combined, meaning it most likely dries naturally.
- There are no records of native fish in Rocky Creek.
- Brown trout are listed as abundant throughout Rocky Creek under the existing water use regime.

16. Station Creek

Station Creek is a tributary of the Upper Lindis River. The only proposed take from it is just upstream of the SH8 Bridge (Figure 37).

Station Creek doesn't have any flow information; however, the nearby Rocky Creek has a flow site where natural flows are recorded. This data can be used to create a synthetic flow record for Station Creek by adjusting Rocky Creek's naturalised flow record based on catchment size.

Figure 37 shows the relevant Rocky Creek flow site with a catchment area of 20 km^2 and the catchment area of Station Creek of 15.5 km^2.

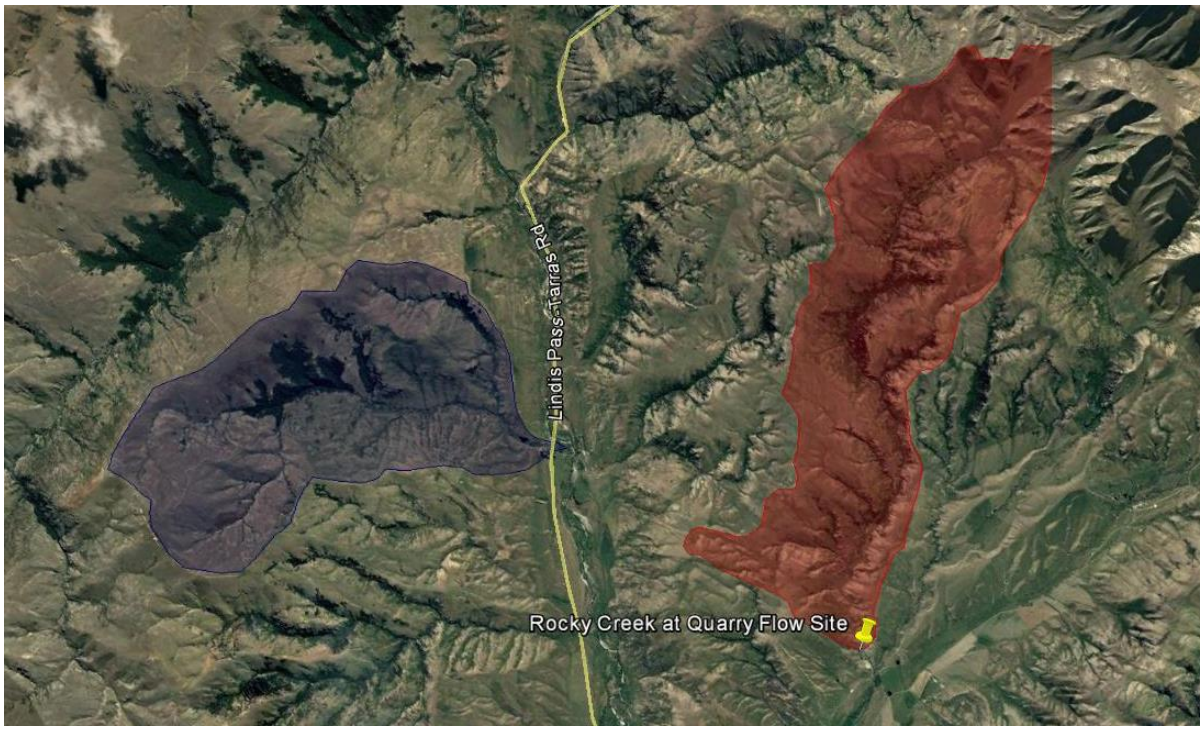


Figure 37. Map showing the Rocky Creek catchment area (shaded red) above ORC's temporary flow site and the Station Creek Catchment (shaded blue).

Table 10 below provides basic flows statistics for the synthetic flow record for Station Creek based on measured naturalised flows for the nearby Rocky Creek; it shows that Station Creek is dominated by low stable flows, with flows generally less than 0.020 m^3/s much of the time.

Table 10: Synthetic Daily Average Natural Flows for the Station Creek based on recorded flows for the nearby Rocky Creek.

Season	Min (m^3/s)	Median (m^3/s)	Mean (m^3/s)	Max (m^3/s)	7-day Min (m^3/s)
12/13	0.025	0.049	0.082	0.679	0.026
13/14	0.018	0.065	0.120	1.655	0.018
14/15	0.014	0.060	0.096	0.671	0.016
15/16	0.012	0.034	0.062	0.295	0.012

Figure 38 below provides a graph of the 14/15 hydrological year to understand the natural flow pattern on an annual time scale.

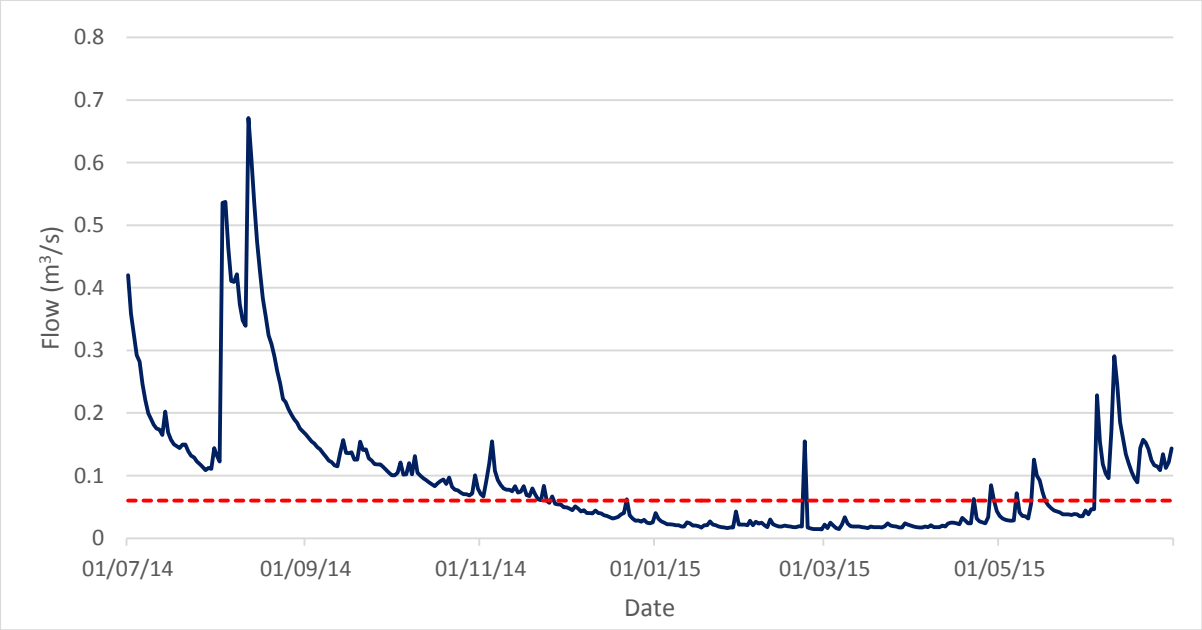


Figure 38. Natural daily flows for Station Creek over a 12-month period (July 2014 -June 2015). Red dashed line is the median flow recorded for the period of 60 l/s.

Figure 38 shows that generally the summer flow pattern for Station Creek is characterised by low flows with very few flushes. From June to the start of November Station Creek has higher sustained flows due to rain and snow melt.

Observations from the landowner indicate that Station Creek flows at all times, although it reduces to very low flows in summer.

16.1. Instream Ecology

Schedule 1A of the Regional Plan: Water for Otago makes no mention of significant ecosystem values being present in Station Creek (ORC, 2016).

A search of NIWA's Freshwater Fish Database for Station Creek contains three records with brown trout and longfin eel the only species recorded. Trout numbers indicate they are abundant.

16.2. Residual Flow Discussion

Although Station Creek experiences naturally very low flows at the point of take (less than 0.015 m^3/s) it is unlikely that it would naturally dry except perhaps in the most extreme seasons. The take being applied for from Station Creek is a supplementary take which means it is likely to be restricted by the supplementary minimum flow for the Lindis catchment, preventing the take from occurring during summer except during freshes.

A residual flow at the point of take of 0.20 m^3/s is recommended for this take to protect the ecological values present.

16.3. Summary

- Station Creek naturally experiences low summer flows (less than 0.015 m^3/s).
- Station Creek doesn't naturally dry based on observation by the landowner.
- Large numbers of juvenile brown trout occupy Station Creek.
- The supplementary minimum flow for the Lindis catchment will restrict the take for the majority of the summer.
- A residual flow of 0.020 m^3/s is recommended to protect the ecological values.

17. McKenzie Creek

McKenzie Creek is a tributary of the Upper Lindis River. The only proposed take from it is just upstream of the SH8 Bridge.

McKenzie Creek doesn't have any flow information; however, the nearby Rocky Creek has a flow site where natural flows are recorded. This data can be used to create a synthetic flow record for McKenzie Creek by adjusting Rocky Creek's naturalised flow record based on catchment size.

Figure 39 shows the relevant Rocky Creek flow site with a catchment area of 20 km^2 and the catchment area of McKenzie Creek of 13 km^2.

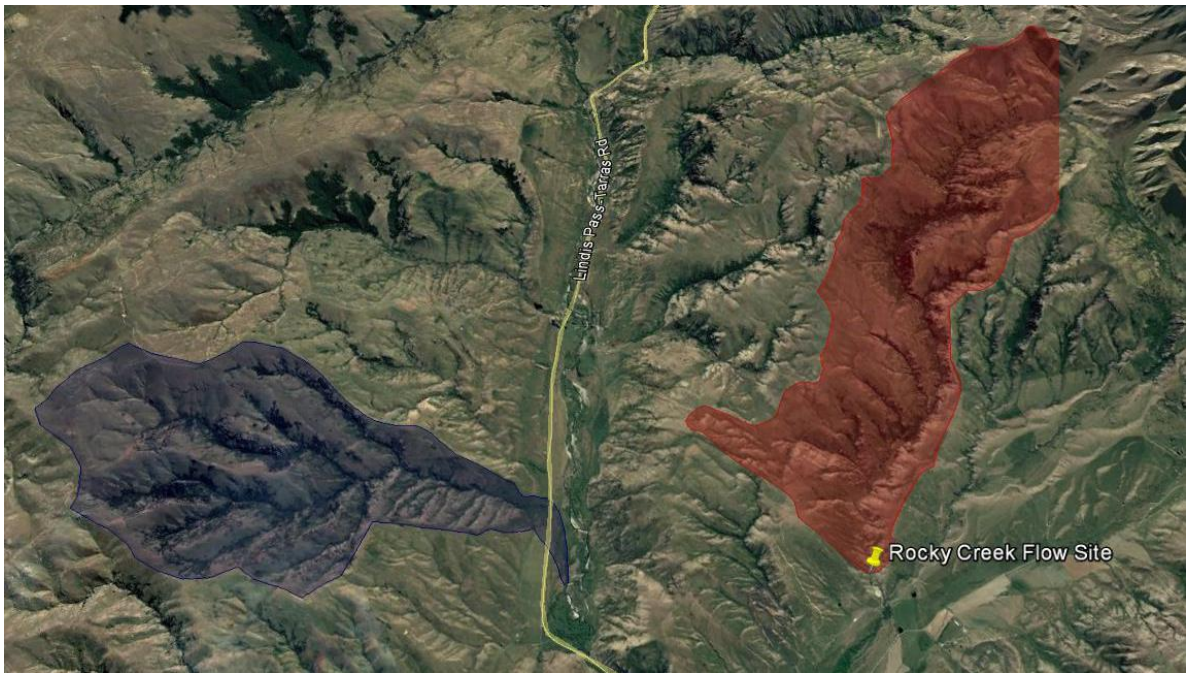


Figure 39. Map showing the McKenzie Creek catchment area (shaded blue) and the area above ORC's temporary flow site on Rocky Creek (shaded red).

Table 11 below provides basic flow statistics for the synthetic flow record for McKenzie Creek based on measured naturalised flows for the nearby Rocky Creek; it shows that McKenzie Creek is dominated by low stable flows, with flows generally less than 0.050 m^3/s much of the time.

Table 11: Synthetic Daily Average Natural Flows for the McKenzie Creek based on recorded flows for the nearby Rocky Creek.

Season	Min (m^3/s)	Median (m^3/s)	Mean (m^3/s)	Max (m^3/s)	7-day Min (m^3/s)
12/13	0.021	0.041	0.069	0.569	0.022
13/14	0.015	0.055	0.101	1.388	0.015
14/15	0.012	0.051	0.080	0.563	0.013
15/16	0.010	0.028	0.052	0.248	0.010

Figure 40 below provides a graph of the 14/15 hydrological year to understand the natural flow pattern on an annual time scale.

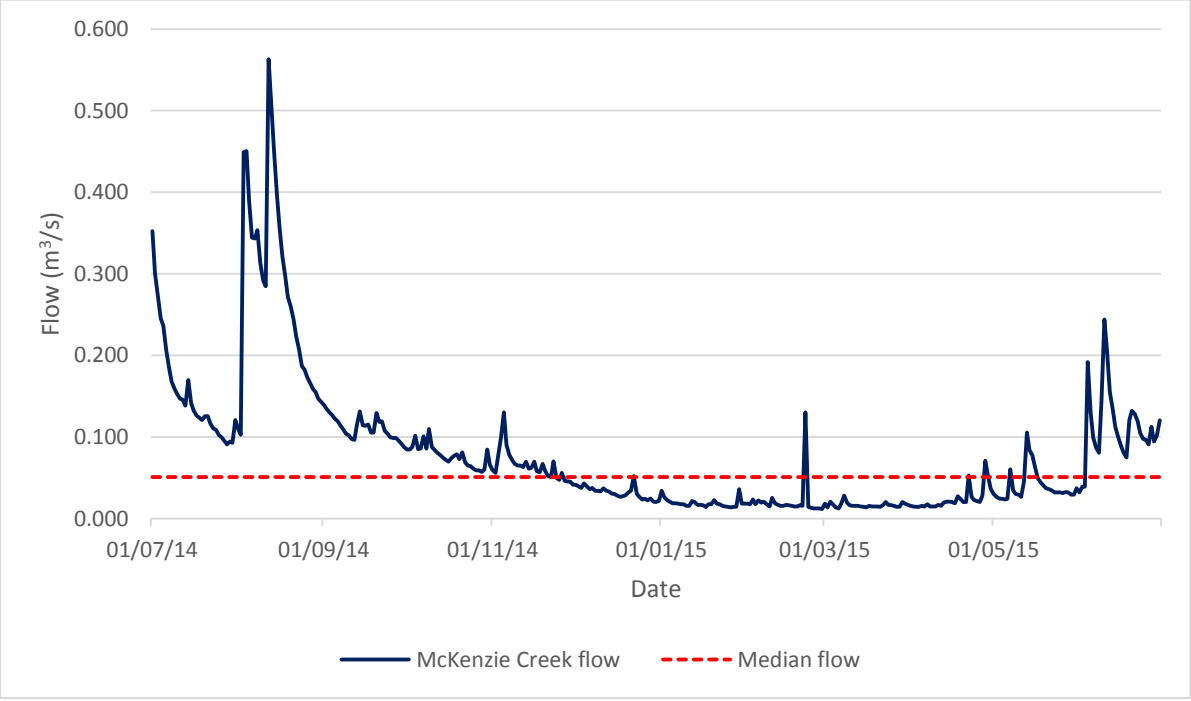


Figure 40. Natural daily flows for McKenzie Creek over a 12-month period (July 2014 -June 2015). Red dashed line is the median flow recorded for the period of 0.051 m^3/s.

Figure 40 shows that generally the summer flow pattern for McKenzie Creek is characterised by low flows with very few flushes. From June to the start of November McKenzie Creek has higher sustained flows due to rain and snow melt.

Observations from the landowner indicate that McKenzie Creek flows at all times, although it reduces to very low flows in summer.

17.1. Instream Ecology

Schedule 1A of the Regional Plan: Water for Otago makes no mention of significant ecosystem values being present in McKenzie Creek (ORC, 2016).

A search of NIWA's Freshwater Fish Database for McKenzie Creek contains one record with brown trout the only species recorded.

17.2. Residual Flow Discussion

Although McKenzie Creek experiences naturally very low flows at the point of take (less than 0.015 m^3/s) it is unlikely that it would naturally dry except perhaps in the most extreme seasons. The take being applied for from McKenzie Creek is a supplementary take which means it is likely to be restricted by the supplementary minimum flow for the Lindis catchment, preventing the take from occurring during summer except during freshes.

A residual flow at the point of take of 0.015 m^3/s is recommended for this take to protect the ecological values present.

17.3. Summary

- McKenzie Creek naturally experiences low summer flows (less than 0.015 m^3/s).
- McKenzie Creek doesn't naturally dry based on observation by the landowner.
- Brown trout occupy McKenzie Creek.
- The supplementary minimum flow for the Lindis catchment will restrict the take for most of the summer.
- A residual flow of 0.015 m^3/s (natural 7-day MALF) is recommended to protect the ecological values.

18. Acknowledgments

I wish to acknowledge Otago Regional Council for providing both flow and water take information. Also, Daniel Jack from the Department of Conservation for electric fishing several streams with no fisheries data to 'fill in the gaps' on fish distributions. Feedback, comments and photos from the Lindis Catchment Group was also much appreciated.

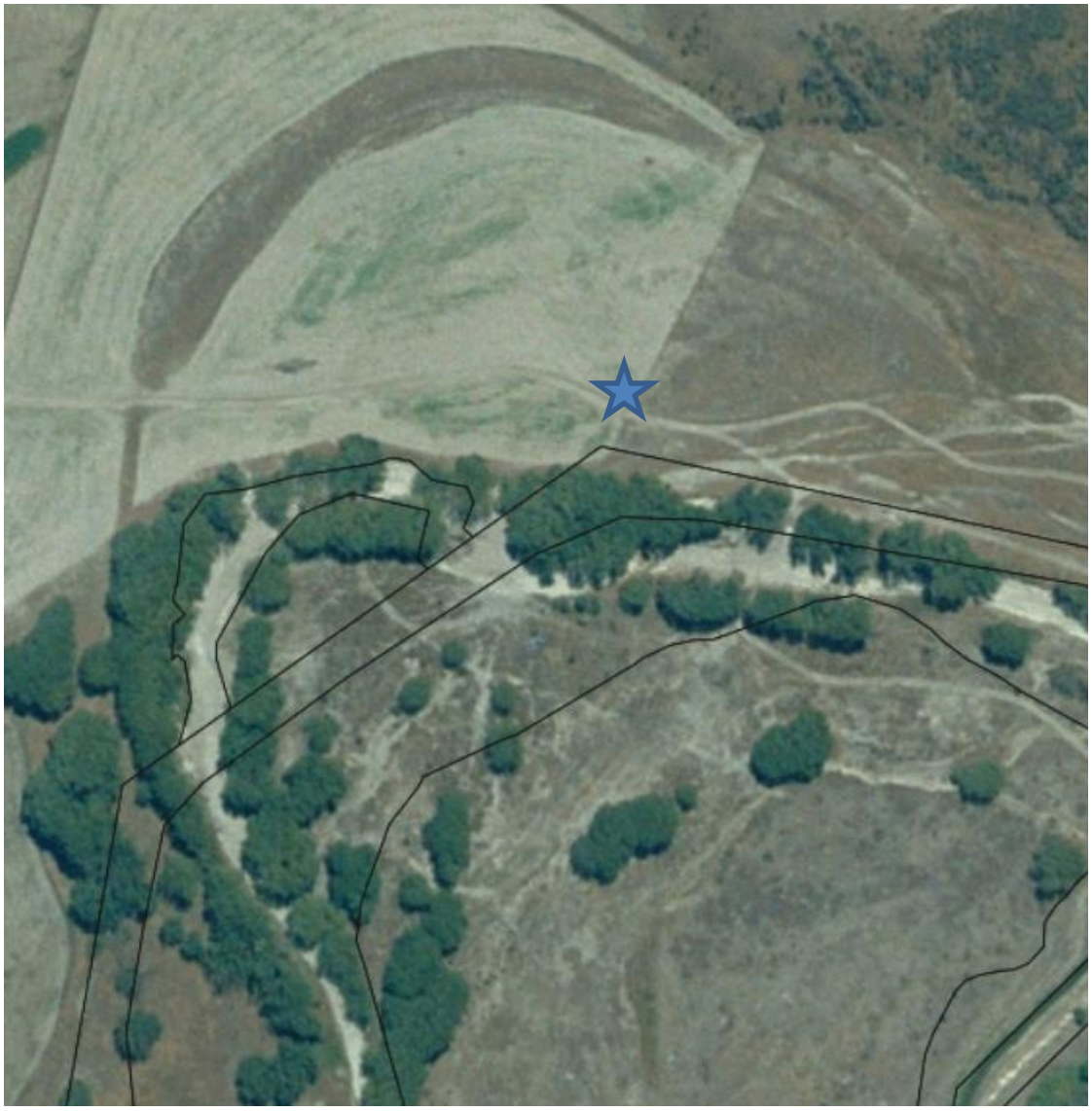
19. References

Otago Regional Council. 2016. Regional Plan: Water for Otago. **ISBN** 978-0-908324-24-8**.**

Appendix E: Proposed Water Take Site

All images in this Appendix are sourced from https://data.linz.govt.nz/

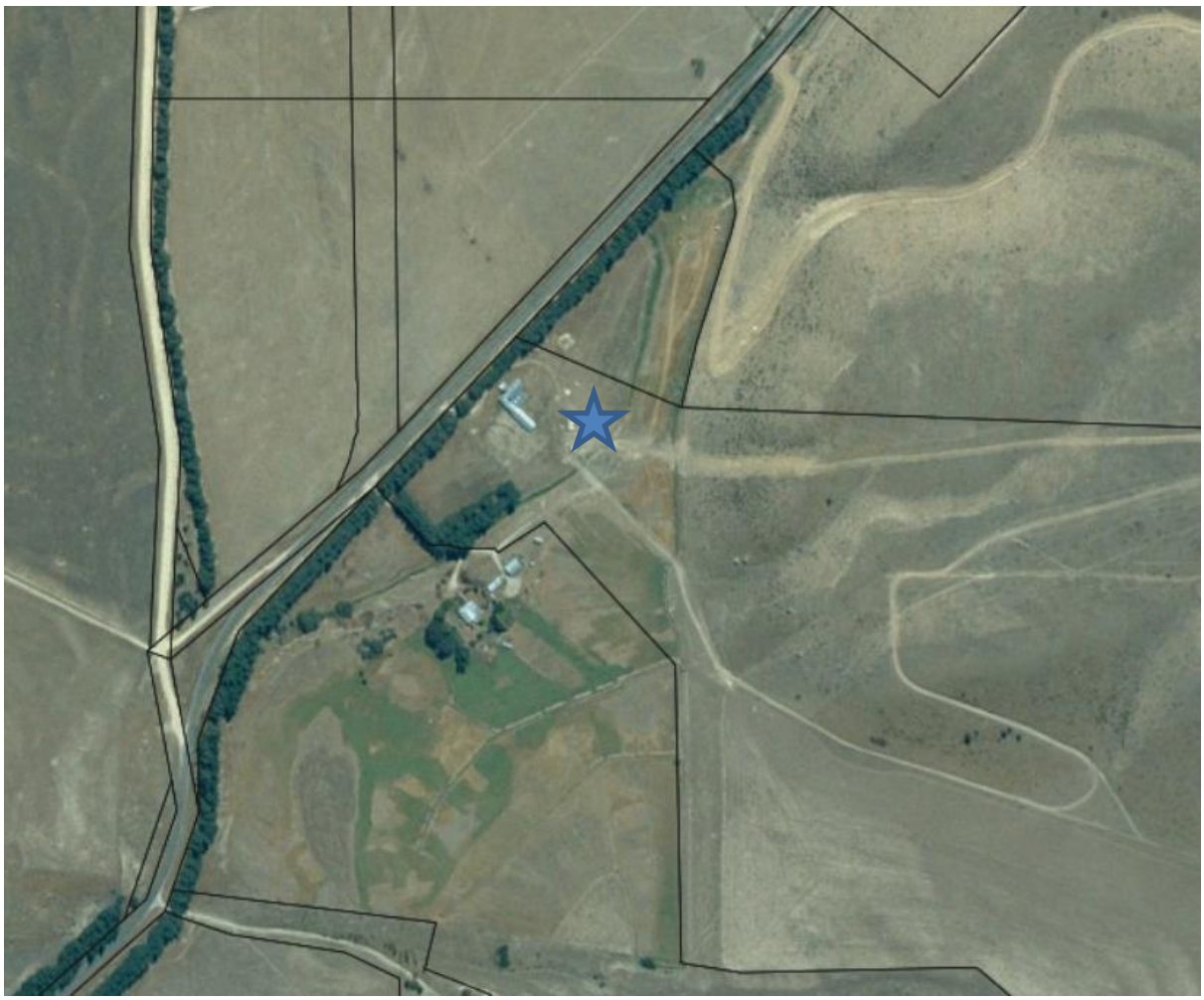
Take T1



Take 2a & b

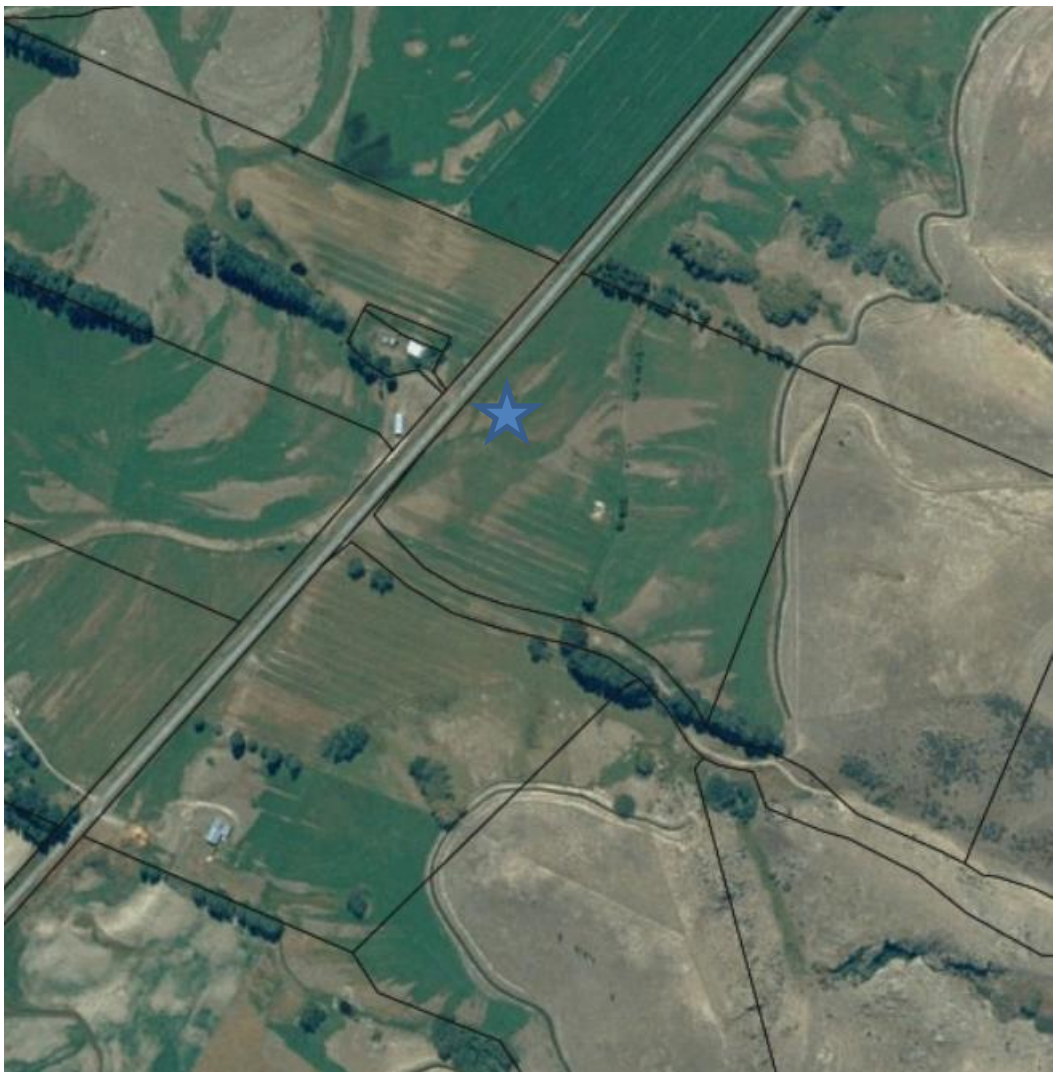
Take T3

Take T4



Take T5

Take A1



Take A2

Take A3

Take A4

Take A5

Take A6

Take A7

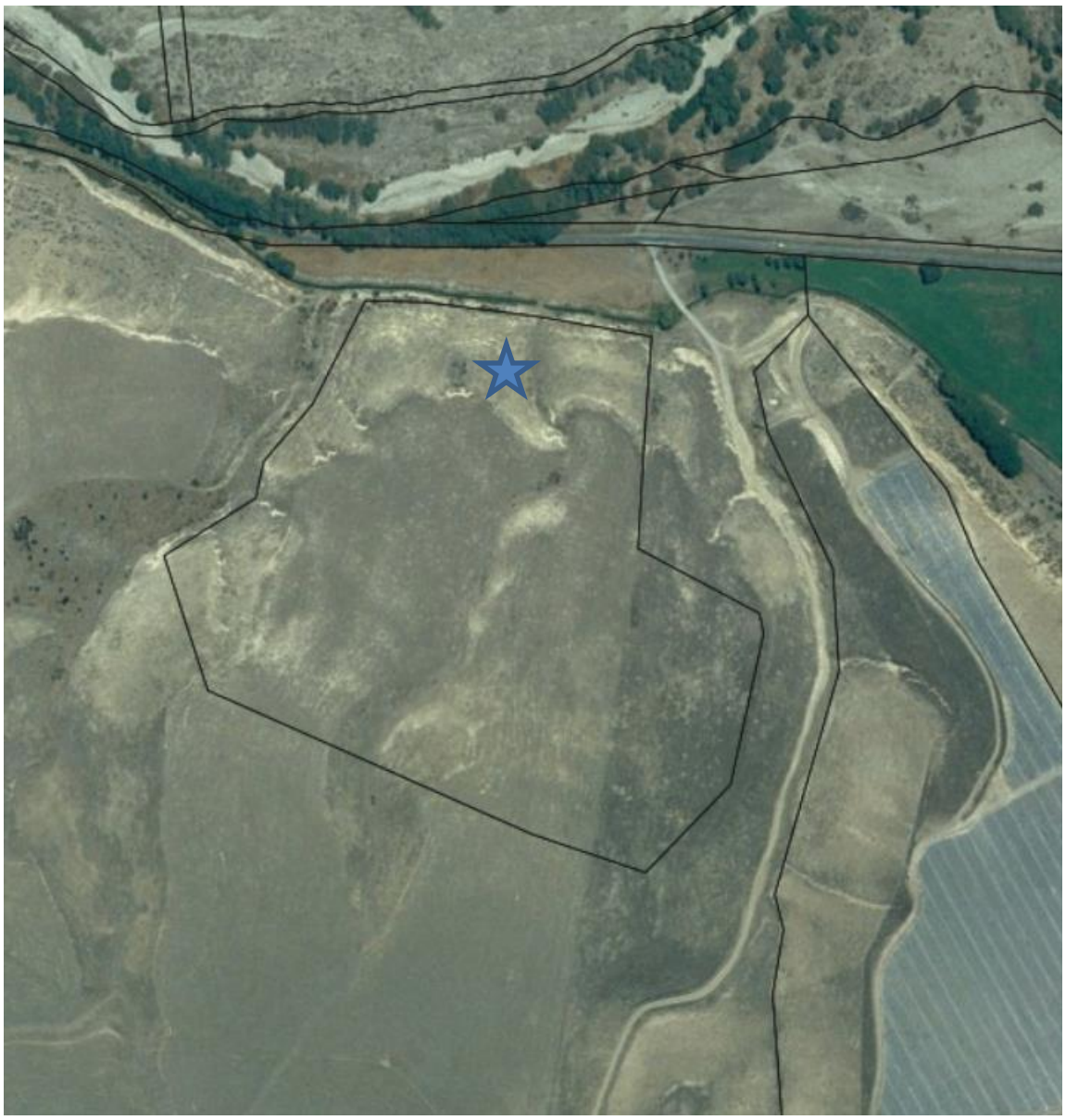
Take A8

Take A9

Rutherford

R13

Take B1



Take 21 and 22