

Pig Burn

Collective replacement of Permits to Take and Use Surface Water

Resource Consent Application
and
Supporting Information

Prepared by McKeague Consultancy
February 2020



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Executive Summary

The Pigburn water users are applying to replace their individual permits collectively and have developed the proposal in this application as a group. This encompasses all of the nine permits relating to water takes from the Pig Burn, including a discharge and a re-take of water taken from the Pigburn. There are eight separate entities taking water from the Pig Burn – some have more than one take and others have a share in one permit. All of these entities are represented by this application.

Accordingly this application is for:

- Water permits to take and use surface water from the Pigburn in the Taieri catchment to replace permits described in Table 1 in Part Two – Supporting Information
- A discharge permit to discharge water to Harpers Creek, Taieri Catchment, to replace a discharge permit described in Table 1 in Part Two – Supporting Information
- A retake permit to take and use surface water from Harpers Creek, Taieri Catchment to replace a retake permit described in Table 1 in Part Two – Supporting Information
- Transfer of take, including a partial transfer of location (providing the ability to take at both the existing location and a new location, depending on flows), and a full transfer of location.

A number of the farms that are the subject of this application have large areas of high-country tussock and improved dryland pasture with small portions of these properties consisting of improved irrigated pasture or crop. A proportion of the total land area reliant on Pig Burn water for irrigation has been converted to dairying over the last 10-15 years.

Many of these operations also source some of their water from the Maniototo East Side Irrigation Scheme. However, the water that is sourced from the Pigburn is a vital part of operations.

This application proposes a change to existing infrastructure through the amalgamation of 3 takes into one take during times of low flows. It also proposes residual flows, a reduction in the total rate of abstraction and annual volume in the Pigburn catchment. Decreases in allocation, whether through instantaneous rates or annual volumes, reduce the actual or potential effects caused by abstraction and will improve flows within the Pigburn when compared to the existing regime.

All takes from the Pigburn are proposed to be screened and are also proposed to comply with the minimum flow at Waipiata on the Taieri River.

It is expected that the flow regime will mimic the natural pattern of gains and losses along the Pig Burn. As such, this proposal is anticipated to result in improvements to the existing flow regime and instream ecological values. This assists in mitigating effects on cultural, recreational, amenity and natural character values.

These proposals reflect the aim of the Pigburn water users to work collectively to manage abstraction in a manner that minimises adverse effects on the Pigburn.

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:

Applicant	Address	Contact	Phone	Email
Pigburn Gorge Ltd	Andrew P Hayes Limited, Central Chambers, 19 Eden Street, Oamaru	Jenny Newth-MacDonald	021 1584688	jenandmike74@yahoo.co.nz
Natasha Lee Burrell, Ian Joseph Burrell and Canterbury Trustees (2016) Limited being trustees of the Duncan Cleugh Farming Trust	c/- Polson Higgs, 139 Moray Place, Dunedin	Natasha Burrell 1199 Telegraph Rd, RD1, Christchurch 7671	03 3773 695 or 021 171 1017	tashburrell@hotmail.com
Janine Ruth Smith	c/- Fraser MacDonald Martin & Co, 13 Pery Street, Ranfurly	Janine Smith	021 02554626	207hamiltonroad@gmail.com
En Hakkore Ltd	Deloitte Touche Tohmatsu, Level 8, Otago House, 481 Moray Place, Dunedin	Sarah Bradfield	03 4449045	sezantbrad@gmail.com
Greenbank Pastoral Limited	C/- Ibboston Cooney Limited, Level 1, 69 Tarbert Street, Alexandra	Gavan Herlihy	0274 764011	herlihy@xtra.co.nz
Hamilton Runs Limited	C/- Ibboston Cooney Limited, Level 1, 69 Tarbert Street, Alexandra	Gerard Weir and Stu Weir	0274447607	hamiltonruns.gerard@gmail.com
Hamiltons Dairy Limited	C/o Ibboston Cooney Limited, Level 1, 69 Tarbert Street, Alexandra	Gavan Herlihy	0274 764011	herlihy@xtra.co.nz
Concept Farms Ltd	PO Box 5241, Dunedin, 9054	Greg Kirkwood and Kelly	Greg 021824625	kirkwoodga@gmail.com

		Kirkwood	and Kelly 021 424625	gkkirkwood@xtra.co.nz
Christopher Patrick Mulholland and Dale Evelyn Mulholland	Ranfurly-Patearoa Road, RD 4, Ranfurly	Chris Mulholland	0272172166	cdmulh@gmail.com
Concept Farms Ltd	PO Box 5241, Dunedin, 9054	Greg Kirkwood and Kelly Kirkwood	Greg 021824625 and Kelly 021 424625	kirkwoodga@gmail.com ; gkkirkwood@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 from the Pigburn in the Taieri catchment to replace permits described in Table 1 in Part Two – Supporting Information
- A discharge permit to discharge water to Harpers Creek, Taieri Catchment, to replace a discharge permit described in Table 1 in Part Two – Supporting Information
- A retake permit to take and use surface water from Harpers Creek, Taieri Catchment to replace a retake permit described in Table 1 in Part Two – Supporting Information
- Transfer of take, including a partial transfer of location (providing the ability to take at both the existing location and a new location, depending on flows), and a full transfer of location.

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

Consent	Consent Holder and Owner (address as specified in previous table unless different)	Occupier
2000.136 2000.245 2000.244	Pigburn Gorge Ltd	N/A
2000.136 2000.245 2000.244	Duncan Cleugh Farming Trust (DCFT)	Jeff Hall R D 4, Ranfurly hallzy@vodafone.co.nz

2000.136 2000.245 2000.244	Janine Smith	
2002.0101	En Hakkore Ltd	N/A
96394	Greenbank Pastoral Limited	N/A
97210	Hamilton Runs Limited - Weirs	N/A
96230.V1	Hamiltons Dairy Limited	N/A
97128	Concept Farms Ltd	N/A
2000.498	Christopher Patrick Mulholland and Dale Evelyn Mulholland	N/A
96254	Concept Farms Ltd	N/A

2 The location of the proposed activity is:

Grid reference: As set out in Table 2 in Part Two – Supporting Information

Legal description: As set out in Table 2 in Part Two – Supporting Information

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

To take and use water for the purpose of irrigation, storage, stock water and domestic supply.

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

10 February 2020

.....
Date

Address for Service for purpose of processing this application

McKeague Consultancy

Attention: Sally Dicey
Resource Management Planner
Email: sally@mckconsultancy.co.nz
Postal: 16 Howard Street, Macandrew Bay, Dunedin 9014
Mobile No: 021 154 6568

Form 4 of the Otago Regional Council

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

Part Two – Supporting Information

1. Introduction

This is an application to replace the current consents in Table 1 and Table 2 below. Table 1 provides an overview of the consent holders, the allocation authorised by the existing consents, the nature of the permits, expiry date and allocation status. Table 2 contains the locations and legal descriptions relating to the activity authorised by the existing consents.

Table 1. Overview of existing consents being replaced by this application

Referred to as	Consent	Consent Holder	Rate (l/s)*	Annual volume (m ³)*	Deemed Permit?	Expiry	Allocation Status or Permit Type
Shared Take	2000.136	Pigburn Gorge Ltd, Duncan Cleugh Farming Trust (DCFT) and Janine Smith 1/3 shares each	86	2,628,000	No	30 Aug 2020	primary
Shared Take – Discharge	2000.245	Pigburn Gorge Ltd, Duncan Cleugh Farming Trust (DCFT) and Janine Smith 1/3 shares each			No	30 Aug 2020	Discharge Permit
Shared Re-take – Harpers Creek	2000.244	Pigburn Gorge Ltd, Duncan Cleugh Farming Trust (DCFT) and Janine Smith 1/3 shares each			No	30 Aug 2020	primary
Bradfields	2002.010 1	En Hakkore Ltd	7	219,000	No	30 June 2022	primary
Herlihy Gorge Take	96394	Greenbank Pastoral Limited Limited	42	1,296,000	Yes	1 Oct 2021	primary
Weirs	97210	Hamilton Runs Limited - Weirs	55.6	1,752,000	Yes	1 Oct 2021	Primary
Herlihy Ford Take	96230.V1	Hamiltons Dairy Limited	111	3,225,600	Yes	1 Oct 2021	primary
Concept South	97128	Concept Farms Ltd	55.6	1,752,000	Yes	1 Oct 2021	primary

Mulholland	2000.498	Christopher Patrick Mulholland and Dale Evelyn Mulholland	55.6	1,752,000	Yes	1 Oct 2021	primary
Concept North Take	96254	Concept Farms Ltd	42	1,296,000	Yes	1 Oct 2021	primary

**Many of the allocation limits have been extrapolated from the limit specified on the existing permits, which are often provided as limits on hourly or monthly volumes.*

Table 2. Locations and legal descriptions relating to the activity authorised by the existing consents

Referred to as	Consent	NZTM 2000 (E N)	Description of Point of Take	Legal Description at point of take	Legal Description where water used
Shared take - Pigburn	2000.136	Current consent: 1372824 4978617 Updating to: 1372797 4978227	Unnamed tributary of the Pig Burn, Rock and Pillar Range, approximately 5 kilometres south east of the intersection of Chirnside Terrace and Aitken Road, Patearoa	Run 204D	Sec 18 Block IV Upper Taieri SD, Sec 6 Block IV Upper Taieri SD Part Sec 23 Block IV Upper Taieri SD and Sec 2 Block VIII Upper Taieri SD Sec 1 Block IV Upper Taieri SD, Lot 1 DP 415149, Sec 14 Block IV Upper Taieri SD
Shared Re-take - Harpers	2000.244	Current consent: 1372319 4983117 Updating to: 1372426 4983118	Unnamed tributary of the Taieri River (referred to locally as Harpers Creek) approximately 2 kilometres upstream of the Hamiltons-Patearoa Road Bridge, Patearoa	Pt Sec 23 Blk IV Upper Taieri SD	Sec 1 Block IV Upper Taieri SD, Lot 1 DP 415149, Sec 14 Block IV Upper Taieri SD
Shared Discharge	2000.245	Current consent: 1373215.395 4980453.669 Updating to: 1373216 4980451	Unnamed tributary of the Taieri River, known locally as Harpers Creek, Rock and Pillar Range, Patearoa	Sec 2 Blk VIII Upper Taieri SD (point of discharge)	Sec 14 Block IV Upper Taieri SD
Bradfields	2002.0101	1374521 4981919	The Pig Burn, Rock and Pillar Range, approximately 3.6km south east of the of the intersection of Roberts Road and Hamiltons Road	Reserve through Part Run 204B Block I Rock & Pillar SD	Sec 64 Block I and Section 65 Block I Rock & Pillar SD and Part Sec 66, 81 Block I Rock & Pillar SD

Referred to as	Consent	NZTM 2000 (E N)	Description of Point of Take	Legal Description at point of take	Legal Description where water used
Herlihy Gorge	96394	1374119 4983920	Pig Burn, Approximately 1.6 kilometres south east of the intersection of Roberts Road and Hamilton Road, Patearoa	Pt Run 204B	Lot 2 DP 441480 Sec 13 Blk 4 Upper Taieri
Weirs	97210	Current consent (incorrect): 1328397 4984570 Updating to correct location: 1373719 4985082	Pigburn, upstream of Hamilton's Road, Waipiata	Marginal strip (Crown land Blk IV Upper Taieri Survey District, SO 1827) adjacent to Pt Run 204B Rock and Pillar Survey District	Secs 7,8, 9-10, 11, 21,22 Block IV Upper Taieri SD, Part Run 204b and Sec 25-26 Block IV Upper Taieri SD, Sec 16-18 and Part Sec 15 Block XIV Maniototo SD, Lot 2 DP 313479 and Sec 35 Block I and Secs 62, 67, 69, 71, 75-76, 79-80, 85-87, 89 Block I Rock & Pillar SD
Herlihy Ford Take	96230.V 1	1373417 4985319	Pig Burn, immediately adjacent to Hamilton Road, approximately 348 metres north east of the intersection of Hamilton Road and Roberts Road, Patearoa.	Pt Run 204B	Lot 1 DP 397751, Lot 1 DP 431784, Lot 1 DP 500044 Sec 48 Blk 1 Sec 12, Blk II Upper Taieri SD, Sec 18 Blk XIII Maniototo SD, Lots 2-5,7-9 84DP 4317, Sec 4 SD 24830, Sec 7 Blk I Upper Taieri SD, Sec 14 Blk XIII Maniototo

Referred to as	Consent	NZTM 2000 (E N)	Description of Point of Take	Legal Description at point of take	Legal Description where water used
					SD, Lot 2 DP 427338, Lot 1 DP 441480 Upper Taieri SD
Concept South	97128	Current consent: 1372715 4986619 Updating to: 1372833 4986146	Pig Burn, approximately 930 metres north northwest of the intersection of Roberts Road and Hamilton Road, Waipiata, Maniototo	Marginal Strip (Crown land Blk IV Upper Taieri Survey District, SO12392) adjacent to Sec 25, Blk IV Upper Taieri Survey District.	Sec 19, Sec 31 and Pt Sec 32 Blk XIV Maniototo SD and Sec 2 SO 24830 Sec 11 and Sec 12 Blk XIV Maniototo SD Secs 33 – 35 Blk XIV Maniototo SD Sec 23 Blk XIV Maniototo SD Pt Lot 3 DP 340765
Mulholland	2000.498	Current consent: 1372615 4987119 Updating to: 1372568 4987145	Pig Burn, 550 metres upstream of the Patearoa-Waipata Road bridge	Sec 19 Blk XIV Maniototo Survey District	Sec 1 SO Plan 23520, Section 1 SO Plan 23521, Lot 1 DP 427338
Concept North	96254	Current Consent 1372711 4990720 Updating to: 1372749 4990742	On the left bank of the Pig Burn, approximately 700 metres upstream of the confluence of the Pig Burn and the Taieri River, Waipiata, Maniototo	Sec 35 Blk XIV Maniototo Survey District	Sec 19, Sec 31 and Pt Sec 32 Blk XIV Maniototo SD and Sec 2 SO 24830 Sec 11 and Sec 12 Blk XIV Maniototo SD Secs 33 – 35

Referred to as	Consent	NZTM 2000 (E N)	Description of Point of Take	Legal Description at point of take	Legal Description where water used
					Blk XIV Maniototo SD Sec 23 Blk XIV Maniototo SD Pt Lot 3 DP 340765

Certificates of title for the properties associated with these water takes are contained in Appendix A.

A consent term of 35 years is sought. Reasons to support the requested consent term are provided within the application document.

There is a long history of abstraction from the Taieri catchment, with many water rights originally being granted for mining purposes. The network of water races that were created to convey water to mining areas, and later for early agricultural use still grace the Rock and Pillar Ranges and are a working monument to Otago's early pioneers and its gold mining history.

Many of the old mining rights still exist but are now being used for agriculture and domestic purposes. This abstraction for irrigation, stock water, domestic use (and fire-fighting) is vital for the success of farming in the Maniototo region.

The Pigburn catchment was also one of the historical sources of water for the old Waipiata Sanatorium at Orangapai, as well as the farm and associated buildings that serviced the sanatorium historically. This property, now a private retreat, relies on water from the Pigburn as its primary source of water.

1.1 Group approach

The Pigburn water users have chosen to replace their individual permits collectively and have developed the proposal in this application as a group. Acting collectively was a logical choice for the water users of the Pigburn:

1. All takes will be managed relative to the Minimum Flow site at Waipiata on the Taieri River.
2. It enabled them to recognise the historical system of priorities and the impact this has on access to the water resource, in addition to consented rates of abstraction.
3. Using local knowledge to understand the river and manage abstractions makes good sense.

The Pigburn water users are not proposing to form a Water Management Group. This application proposes the amalgamation of 3 takes into one take point, residual flows and compliance with the minimum flow at Waipiata. These measures negate the need for further low flow sharing as will be explained in more detail in Section 8.1.

2. Description of Activity

2.1 Location

This application concerns water takes from the Pig Burn. The Pigburn has its headwaters in the northern end of the Rock and Pillar Ranges in Otago and flows down the north eastern flanks of this range. From there it flows between Patearoa and Waipiata to join the Taieri River.

The map references of the points of abstraction are provided in the Table 2 in this document.

Photographs of the existing and proposed points of abstraction are provided in Appendix B. An overview of the properties subject to this application is shown in Figure 1.

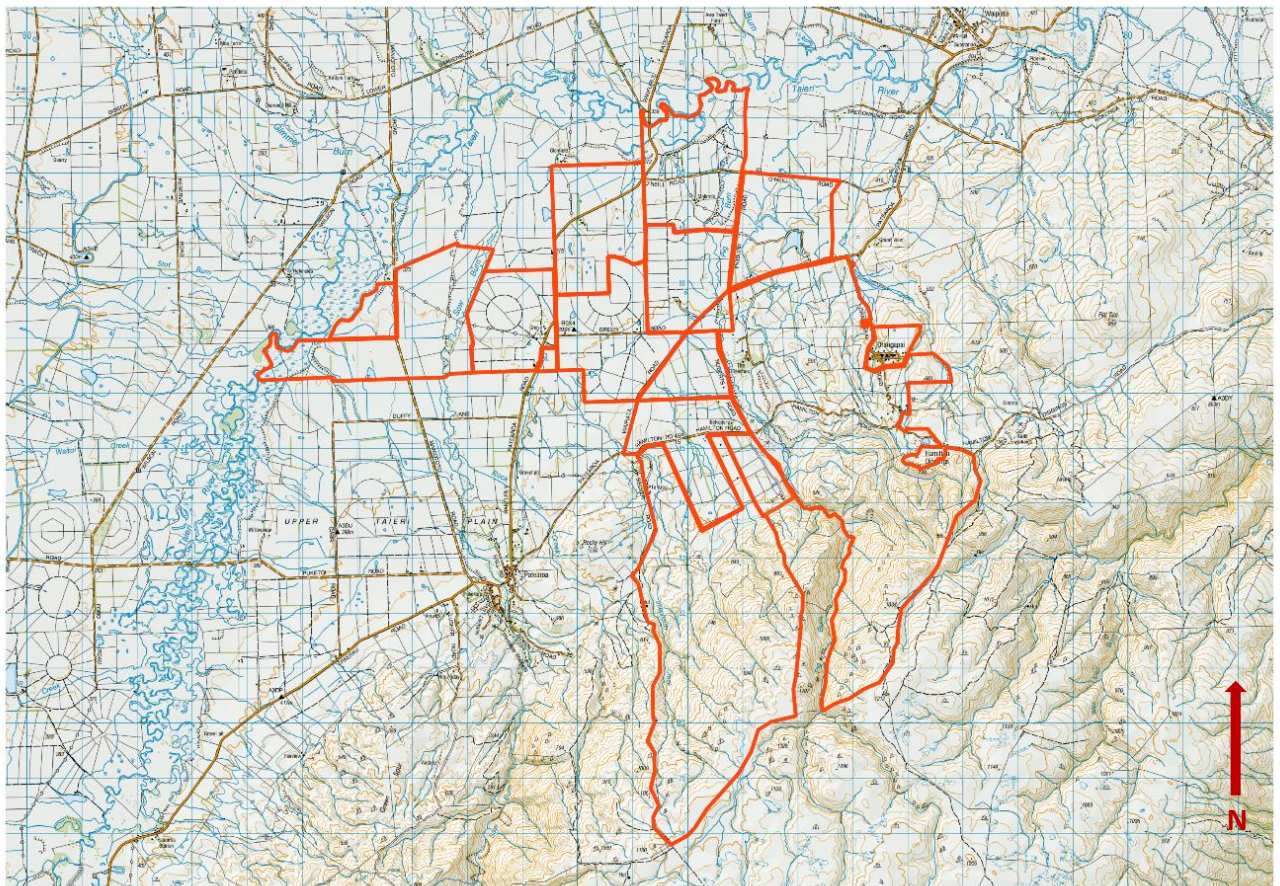


Figure 1: Properties subject to this application

2.2 Overview of water takes and use

There are nine permits relating to the Pig Burn, with two of these being a discharge and re-take of water taken from the Pigburn. There are also eight separate entities taking water from the Pig Burn – some have more than one take and others have a share in one permit.

A number of these farms have large areas of high-country tussock and improved dryland pasture with small portions of these properties consisting of improved irrigated pasture or crop. A proportion of the total land area reliant on Pig Burn water for irrigation has been converted to dairying over the last 10-15 years. Figure 2 shows the area irrigated with Pigburn water. It is critical to note that a large portion of this area is irrigated in combination with water from other sources. This is noted where relevant in the sections outlining water use on each property.

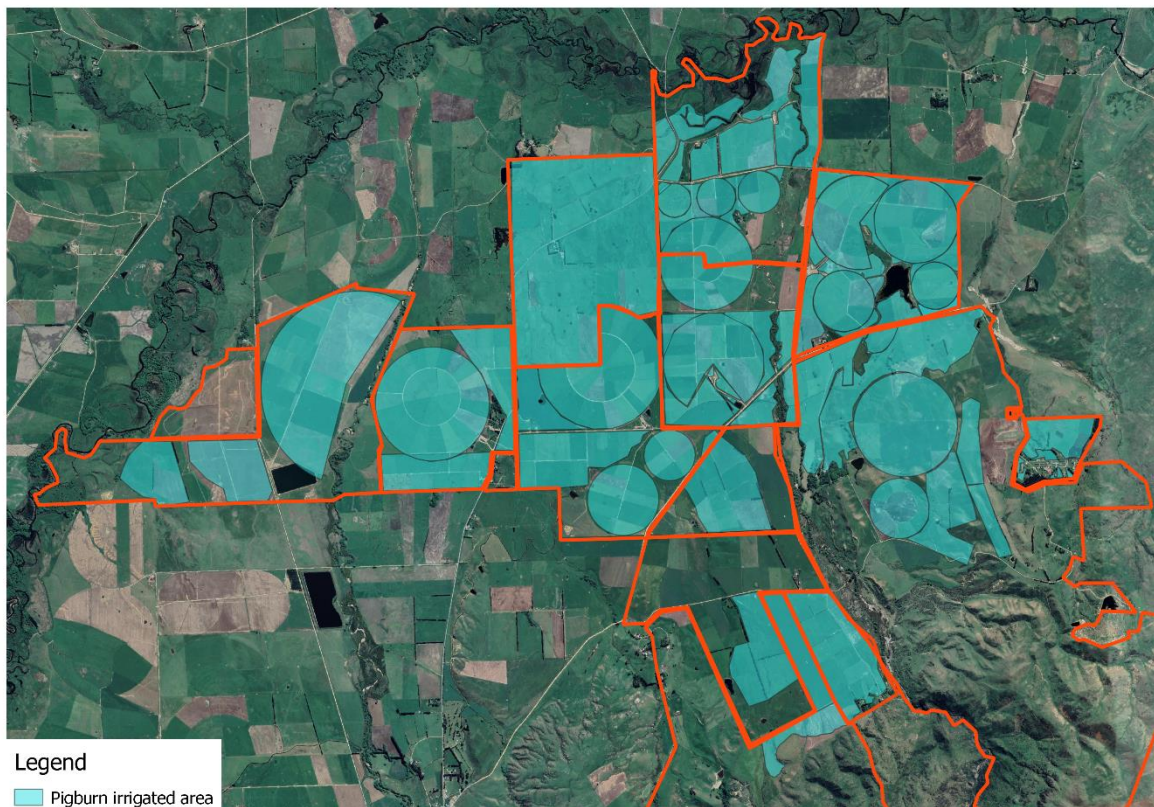


Figure 2: Area irrigated with water from Pigburn (most of these areas are irrigated in combination with water from other sources).

For the predominantly dryland operations, irrigation means that farmers can finish stock rather than sell them as stores or grow winter feed that can be fed in situ or cut for hay and silage. This assists to drought proof these farming operations.

Many of these operations also source some of their water from the Maniototo East Side Irrigation Scheme. However, the water that is sourced from the Pigburn is a vital part of operations.

Wild flooding is still utilised in this catchment, and this reflects the reliability of supply of the Pigburn, as in a dry year it may only supply water for up to 2 months in the Spring. This makes investment in more efficient spray irrigation more challenging. However, many of the water users have constructed storage dams in recent years and are currently developing or planning to develop further dams within the next 5 years. This requires significant investment but will allow a further shift away from wild flooding to spray irrigation which will include the installation of pivots.

To make the investment in storage and spray irrigation cost effective, it is critical that these water users have access to water in the Pig Burn in winter months.

All of the permit holders take primary responsibility for ensuring their irrigation infrastructure is maintained and in good working order by regularly checking and maintaining their infrastructure. They also contract in technical expertise as required e.g. calibration of water metering equipment, or dam design and construction.

While some of the applicants' properties have alternative water sources, no further water can be taken from alternative water sources as primary allocation as the Taieri catchment is considered 'fully-allocated' under the Otago Regional Council's Regional Plan: Water for Otago (RPW). On this basis the applicants have not considered taking water from other sources, beyond those that some of the properties already have access to.

Maps in the sections below show the location of the existing points of take and all other applicable details:

- The location of the existing and proposed point(s) of take and all associated infrastructure (where no take is specified but a race is shown then the point of take is where the race begins, please also refer to Figure 2 of Appendix C for an overview of take locations).
- The location of the water measuring device(s) or system(s)
- The total property area boundary
- The area(s) to be irrigated by water applied for under this application
- Other surface water bodies and wetlands (these are shown on the topographical map in Figure 1 above and are also identified on the Concept Farms maps).
- The location of any dairy shed(s)

The following are not relevant to this application and so are not mapped:

- Community supply
- Distances to any discharge activities.
- The coastline and the distance to it.
- Recreational activities – no known recreational activities occur on the Pigburn.
- Other water takes - No other water takes occur on the Pigburn.
- Areas of significance to iwi and areas where food is obtained from the water body – no specific sites are known.

2.2.1 Pigburn Gorge Ltd / Duncan Cleugh Farming Trust /Smith

Pigburn Gorge Ltd, Duncan Cleugh Farming Trust (DCFT) and Janine Smith hold 3 permits in common which enable them to take water from the uppermost reaches of the Pigburn (Consent 2000.136), discharge it to Harpers Creek (Consent 2000.245) and then retake it at the base of the Rock and Pillar Range (Consent 2000.244) , from there it is conveyed along an open race for use on the permit holders' properties.

The race system used in accordance with these permits “was originally authorised by a mining privilege that appears to not have been notified. Subsequent rights have been granted for the activity with the most recent right being 3605” (ORC Recommending Report 2000/481, 23 August 2000). This means that this application seeks to replace these permits as permits that were originally granted prior to February 1998.

The intake is situated in the upper reaches of the Pig Burn at an altitude of 900m asl on one of the headwater tributaries of the Pig Burn. Water is taken via a pipe that is situated in the waterway in a manner that allows flood waters to wash over the intake. The water is then conveyed in an open race for approximately 3 km through a saddle between the Pig Burn and Harpers Creek catchments and is discharged into Harpers Creek. At an altitude of approximately 500m asl it re-enters another open race and is gravity fed to the three properties associated with this abstraction. The conveyance from the take point to the re-take is some 6km to 8km long. The abstraction point and use of the existing race enables the use of gravity to convey water to these properties.

Except during winter and heavy rainfall events Harpers Creeks is a dry gully. The discharge of this water into Harpers Creek means that Harpers Creek flows for a longer period in spring than it would otherwise flow. Surface flow will remain below the point of take in the Pig Burn, even during dry periods. Harpers Creek is always dry below the re-take point apart from the start of spring and in heavy rain events.

Pig Burn water is the only water used on the Smith and Pigburn Gorge properties, and the only water used on part of the Tearoa property. This water is vital for domestic use (on Pigburn Gorge) and stock water for these properties. In addition, this water is highly valued for irrigation from September until November, as irrigation at this time is very important for establishing crops and getting them off to a good start early in the season. This approach utilises water when it is most available.

While irrigation is occurring each property accesses water on a week-long rotation, but at all times leave sufficient water for the domestic and stock water purposes for the other 2 properties.

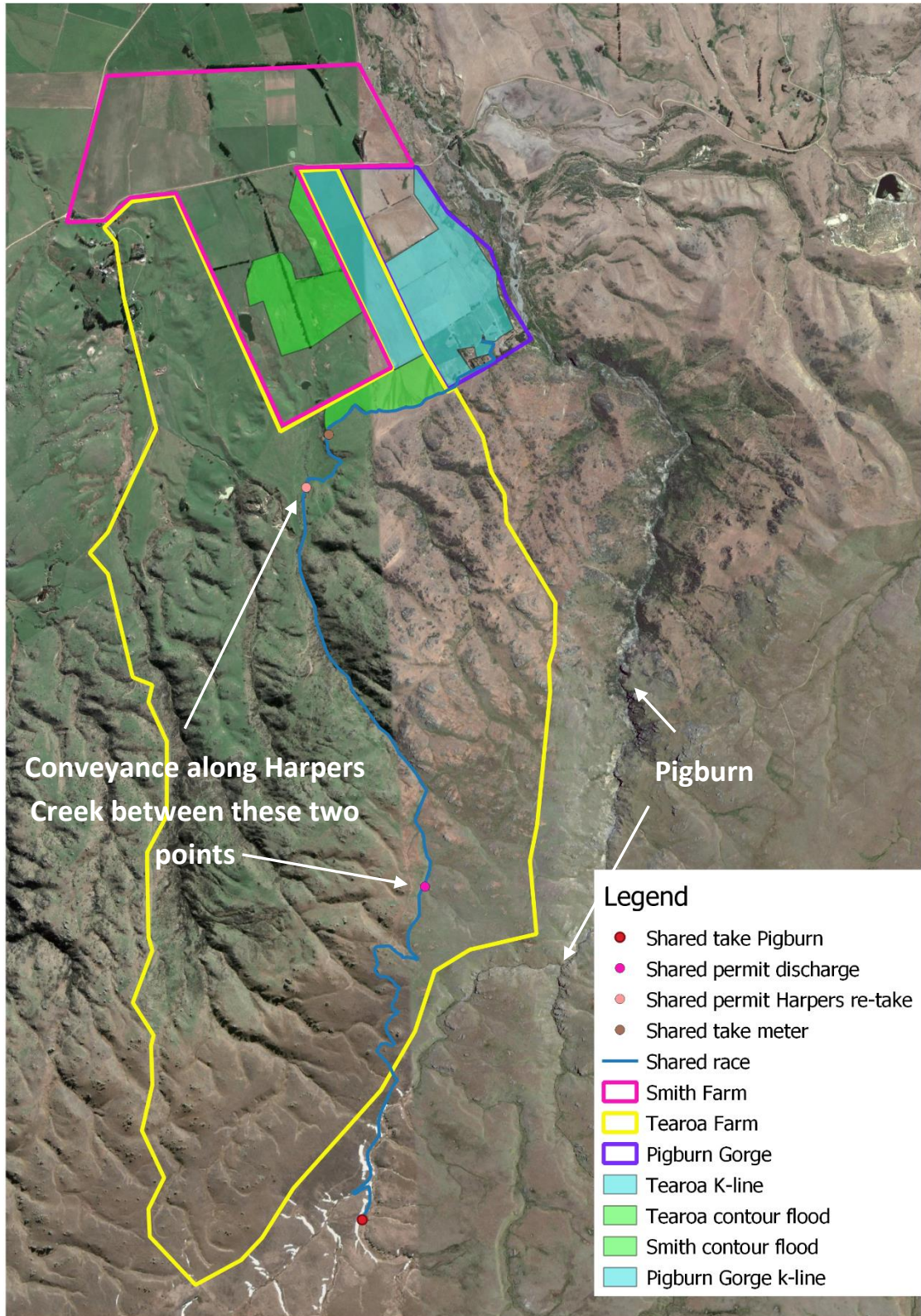


Figure 3: Shared permit – MacDonald, Smith and Tearoa Properties

2.2.1.1 Pigburn Gorge Ltd

Pigburn Gorge Ltd owns and operates a sheep and beef farm which has previously relied on flood irrigation. K-lines have recently been established on this property and this transition has enabled the irrigated area to increase from 60 hectares to 80 hectares, with an increase in productivity.

The owners of Pigburn Gorge Ltd, the Newth-MacDonald family live on the farm and rely solely on water from the Pig Burn for domestic water – they do not have access to any other source of water for domestic use. The farm also relies on this water for stock water.

This was made possible by the storage dam recently built on the property, which is 25,000m³ in capacity.

While this property is 85 ha, it is farmed in conjunction with a dryland block owned by another MacDonald family member, that is directly adjacent. This block extends from the southern boundary of the Pigburn Gorge Ltd block up into the Rock and Pillar Range, and is a dryland block.

Table 3. Use of Water by Pigburn Gorge Ltd

Information	Property Details
Size of property	85 hectares, but farmed in conjunction with 271.5ha block adjacent to the property.
Size of area irrigated	80 hectares
Sources of Water	Pig Burn only
Maximum recorded rate of take (from metering data)	As maximum rate abstracted under the shared permits: 99 l/s (excluding peaks in data that are likely to be errors)
Maximum recorded annual volume (from metering data)	495,472m ³ as combined total for this permit, this property has 1/3 share of this.
Aqualinc calculation of maximum efficient use	505,086m ³ for this property
Number of stock	1000 stock, primarily sheep
Stock drinking water (based on ORC values for efficient stock water in Form 4, F.10)	5000 l/head/day
Frequency of water take (average and maximum)	24 hours per day 7 days per week 4 weeks per month when water is available
Months during which water is expected to be taken in a dry year	Sept to Nov for irrigation, but stockwater at all times
Months during which water is expected to be taken in an average year	Sept to December for irrigation, but stockwater at all times
Part of day water when	24 hours per day

water will typically be taken:	
Does use of water provide recharge back into catchment?	Highly unlikely, irrigation is via k-line.
Is take from re-charge or is an augmented take?	No, except retake from Harpers Creek (Consent 2000.244)
Hectares in a day	80 ha
Storage	25,000m ³ dam

2.2.1.2 Duncan Cleugh Farming Trust – Tearoa Farm

The Duncan Cleugh Farming Trust (DCFT) own Tearoa Farm and lease this property out to Rothesay Downs Ltd (Jeff and Margot Hall). This farm is predominantly a dryland sheep and beef farm.

The race runs across the farm at the base of the foothills of the Rock and Pillar Range, and irrigation is gravity fed from this race.

Historically irrigation on the farm was all by flood irrigation; however, a large proportion of this has been replaced by k-line. Using the k-line to irrigate the Lucerne paddocks in Spring provides the ability to grow the vital supplementary feed for winter.

Given the availability of water from this abstraction, the owners have previously investigated storage to increase reliability of supply. However, due to the topography of their farm, good sites for storage are not readily available. A small storage pond in the race provides the intake for the k-line.

DCFT also holds RM 15.248, 95090 and discharge permit 95294 from Shepherds Creek. This supplies domestic water, stock water and irrigation to the other side of the farm. This water is used separately from the Pigburn water. The area irrigated by the Shepherds Creek water is used for contour flood irrigation over 77ha. The maximum recorded volume for that take is 195,522m³.

Tearoa relies on Shepherd's Creek for domestic water. While the Pigburn water is the sole stock water for part of the farm, in low flow conditions stock are moved off these paddocks to paddocks on the Shepherd's Creek stock water scheme, so that water always reaches the Pigburn Gorge property.

Table 4. Use of Water by Tearoa Farm

Information	Property Details
Size of property	1365.5 hectares
Size of area irrigated	Pigburn water only: 36 ha K-line 12 ha contour flood Shepherds Creek water only: 77ha of contour flood
Sources of Water	Pig Burn and Shepherds Creek but used separately

Maximum recorded rate of take (from metering data)	As maximum rate abstracted under the shared permits: 99 l/s (excluding peaks in data that are likely to be errors)
Maximum recorded annual volume (from metering data)	495,472 m ³ as combined total for this permit, this property has 1/3 share of this.
Aqualinc calculation of maximum efficient use	367,478m ³ - For area irrigated with Pigburn water only on this property only ¹
Number of stock	1200 ewes 12 rams 37 cows 250 R2 steers and heifers
Stock drinking water (based on ORC values for efficient stock water in Form 4, F.10)	18,975 l/head/day
Frequency of water take	24 hours per day 7 days per week 4 weeks per month when water is available
Months during which water is expected to be taken in a dry year	Sept to Nov for irrigation, but stockwater at all times
Months during which water is expected to be taken in an average year	Sept to December for irrigation, but stockwater at all times
Part of day water when water will typically be taken:	24 hours per day when water is available
Does use of water provide recharge back into catchment?	Some recharge may occur as a result of contour flood irrigation
Is take from re-charge or is an augmented take?	No, except for retake from Harpers Creek (Consent 2000.244)
Hectares in a day	48ha
Storage	None at this stage, may be considered in future

¹ The maximum recorded annual volume taken from Shepherds Creek has been assessed as 195,522m³. The Aqualinc calculation of maximum efficient use for the 77ha area irrigated with Shepherds Creek water is 531,160 m³/year.

2.2.1.3 Smith Farm

Janine Smith's farm is a relatively small sheep and beef farm which has undergone limited development. Historically irrigation has been by wild flooding. Pigburn water is used to fill one small dam and a pond (providing stock drinking water) on the farm.

Gravity fed spray irrigation is likely to be developed in the near future. Given the availability of water from this abstraction, spray irrigation is likely to be limited from September to December. Investigations into storage opportunities are also likely.

Table 5. Use of Water by Smith

Information	Property Details
Size of property	Approx 275ha
Size of area irrigated	Approx 60 ha by wild-flooding
Sources of Water	Pig Burn only
Maximum recorded rate of take (from metering data)	As maximum rate abstracted under the shared permits: 99 l/s
Maximum recorded annual volume (from metering data)	495,472 m ³ as combined total for this permit, this property has 1/3 share of this.
Aqualinc calculation of maximum efficient use	403,404 m ³ on this property only.
Number of stock	750 stock units, almost all sheep
Stock drinking water (based on ORC values for efficient stock water in Form 4, F.10)	3,750 l/head/day
Frequency of water take	24 hours per day 7 days per week 4 weeks per month when water is available
Months during which water is expected to be taken in a dry year	Sept to Nov for irrigation, but stockwater at all times
Months during which water is expected to be taken in an average year	Sept to December for irrigation, but stockwater at all times
Part of day water when water will typically be taken:	24 hours per day
Does use of water provide recharge back into catchment?	Some recharge may occur as a result of flood irrigation
Is take from re-charge or is an augmented take?	No, except re retake from Harpers Creek (Consent 2000.244)
Hectares in a day	Up to 60ha
Storage	Existing dam has approx. capacity of 14,000m ³

2.2.2 En Hakkore - Bradfields

David and Margaret Bradfield abstract water from the Pigburn gorge (the Bradfield take). This property incorporates buildings that were historically part of the Waipiata Sanatorium at Orangapai. Twelve houses are situated on the property and water from the Pig Burn provides the primary water supply. One family permanently resides on the property, but church groups visit the property through-out the year – approximately 10 times per year for a few days at a time. Normally groups consist of up to 10 couples or families, however the property can accommodate up to 150 at a time.

The water is also used for irrigating the Bradfield's small farm, which includes sheep and 4 dairy cows. Irrigation occurs with sprinklers which are moved by hand.

The Bradfield family have an existing small storage dam located near the Weir's Hamilton Diggings dam (the Bradfields dam is just downstream of the metering device shown in Figure 4 below). The existing dam holds approximately 20,000m³. The Bradfields are investigating the feasibility of another small dam located on their property, this dam has not yet been designed, but could be approximately 30,000m³. A consent application for this dam would be lodged separately to this application if this dam is progressed.

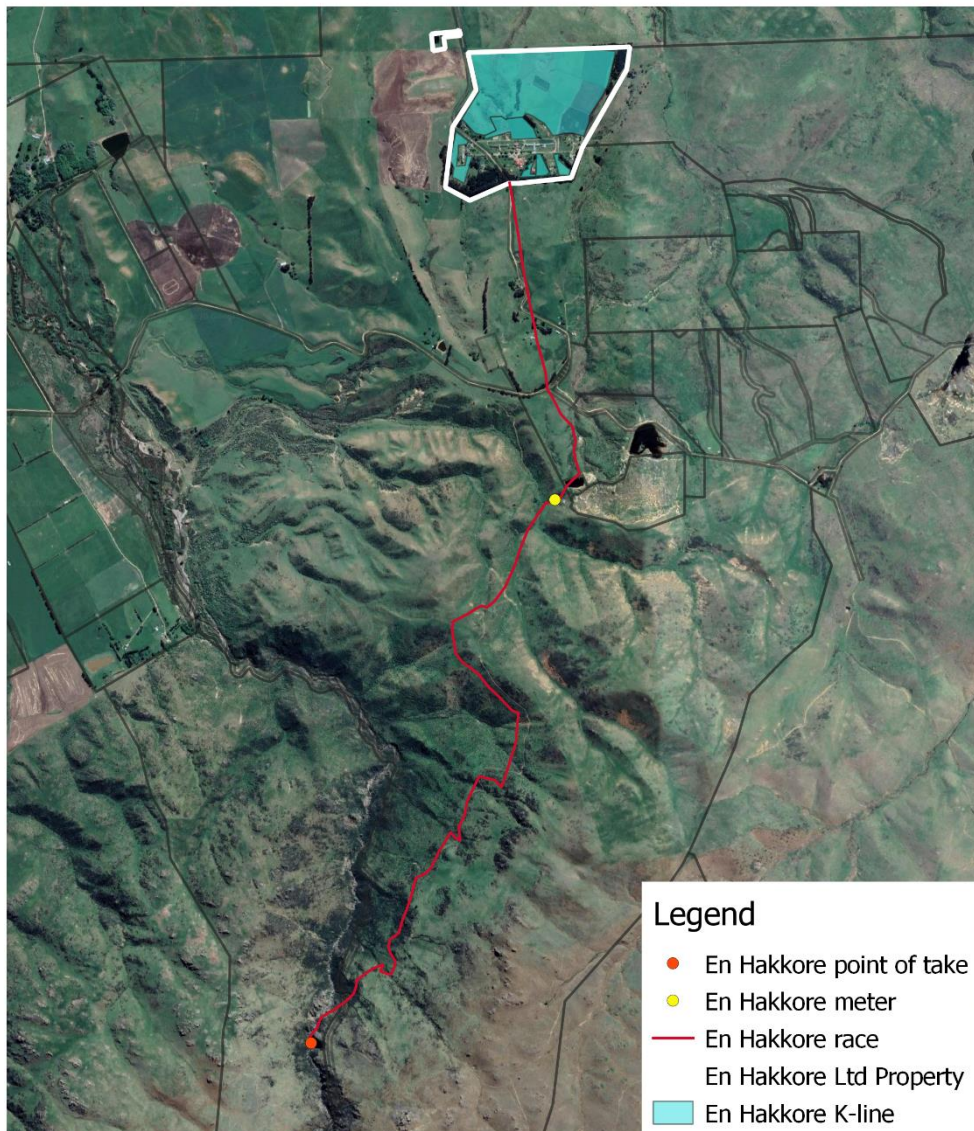


Figure 4: En Hakkore property overview, including Pigburn irrigation race and water meter

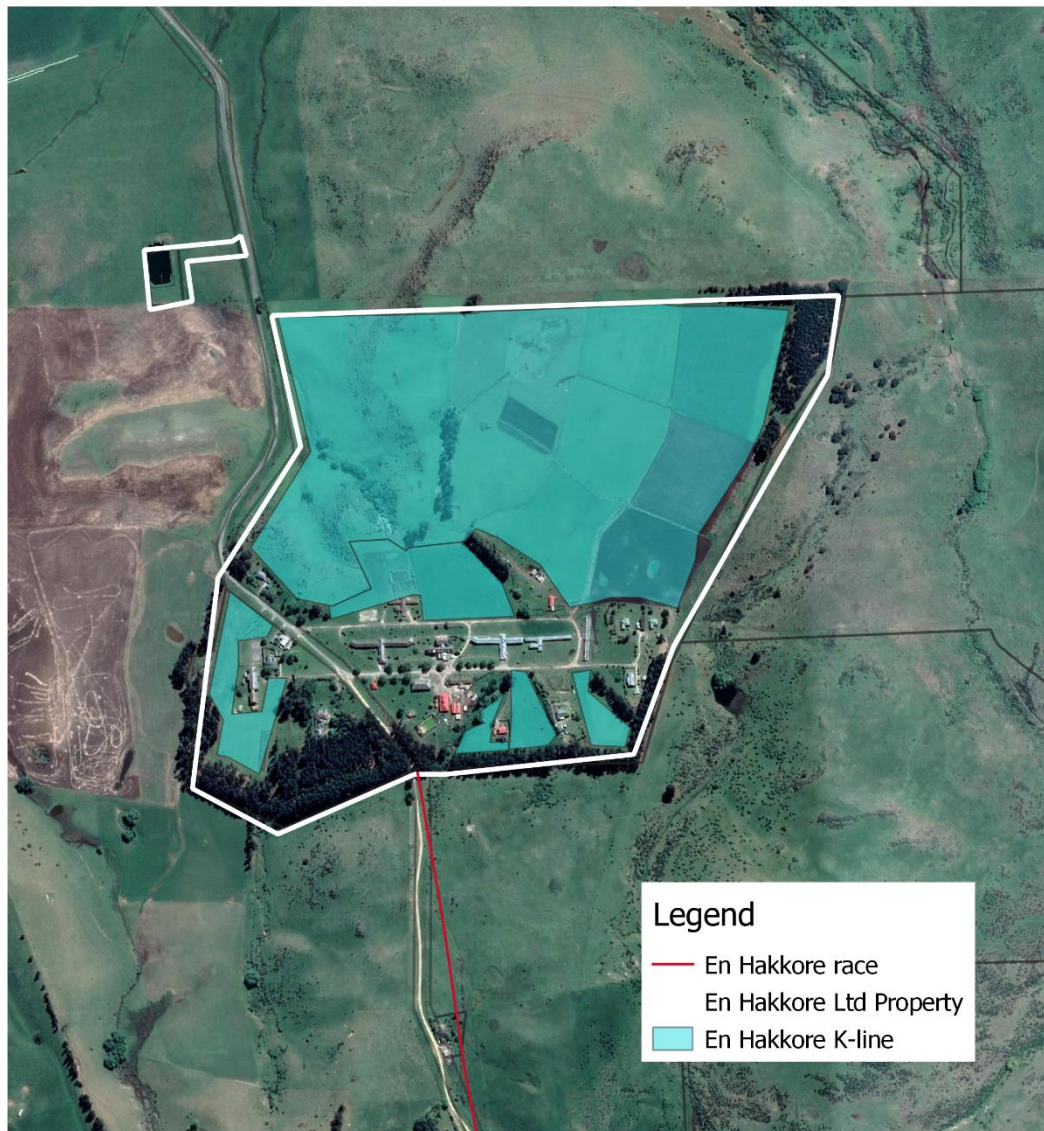


Figure 5: Irrigation on En Hakkore

Water is taken from the Pig Burn gorge through a piped intake and is piped for approximately 5 km. The amount taken is limited by the size of the pipe, rather than the amount in the Pig Burn, as there is always water in the Pig Burn at this point of take.

Table 6. Use of Water by En Hakkore

Information	Property Details
Size of property	57 hectares
Size of area irrigated	25-30 hectares
Sources of Water	Pig Burn only
Maximum rate of take (from metering data)	7 l/s
Maximum annual volume (from metering data)	70,000m ³
Aqualinc calculation of maximum efficient use	238,795 m ³
Number of stock	200 ewes 4 cows
Stock drinking water (based on ORC values for efficient stock water in Form 4, F.10)	1180 l/head/day
Frequency of water take (average and maximum)	24 hours per day 7 days per week 4 weeks per month when water is available
Months during which water is expected to be taken in a dry year	12 months of the year
Months during which water is expected to be taken in an average year	12 months of the year
Part of day water when water will typically be taken:	24 hours per day
Does use of water provide recharge back into catchment?	Highly unlikely, irrigation is via k-line.
Is take from re-charge or is an augmented take?	No
Hectares in a day	25-30 hectares
Storage	20,000m ³

2.2.3 Hamilton Runs Ltd - Weirs

Hamilton Runs Ltd is a family run sheep and beef farm, which is primarily a dryland operation. Irrigation occurs on a small proportion of this property and provides stock feed to fill the winter and dry summer period supply gaps.

Water is taken from the Pig Burn through a short section of pipe to an open race and water is gravity fed to the property. Monitoring occurs at the point of take and was installed by Water Force. The intake site is not ideal as the Pig Burn fans out at this point and water is lost via the gravels. The water is currently delivered by race to storage dams on the property and is primarily piped around the farm from there.

Water is used for domestic supply (2 houses), stock water and irrigation.

Irrigation water is applied using two pivot, k-line, hard hose gun as well as some wild flood. The Weirs have recently invested in a number of dams on the property and have plans to develop further storage on the property, both to improve reliability of supply from existing water sources and enable a further shift to spray irrigation in the future. Advice has been sought from engineers, irrigation and earth-moving contractors on all aspects of irrigation development, including storage. The topography of the farm is well suited to this proposed increase in storage dams. The increased investment in the farm has been a business decision to enable succession planning. There are three generations of the Weir family supported by this farm.

Hamilton Runs Ltd also sources water for this property from the MESIS (15 shares) and the Capburn. It is important to note that the farm is setup in a manner which enables the Pig Burn and Capburn water to be used on any part of the property - depending on availability of water from either source (including in storage dams).

Currently this property has 4 dams as outlined in Table 7 and shown on Figure 6. The Middle and Lower Dams store water from both the Pigburn and Capburn, while the Hamilton's and Buffer Dams only store water from the Capburn.

Hamilton's dam is able to be increased in size by increasing its area, and this would increase its capacity to approximately 70,000 to 80,000m³. This may occur in the next 5 years. Besides a possible increase to the size of Hamilton's Dam, one other dam is also proposed to be developed within the next 5 years, and would have a total capacity of 400,000m³. This dam would be situated just to the south of Middle Dam and would also store Pig Burn water. These are shown on Figure 6. A number of additional sites for dams have been identified on the property, ranging from 6,000 to 400,000m³.

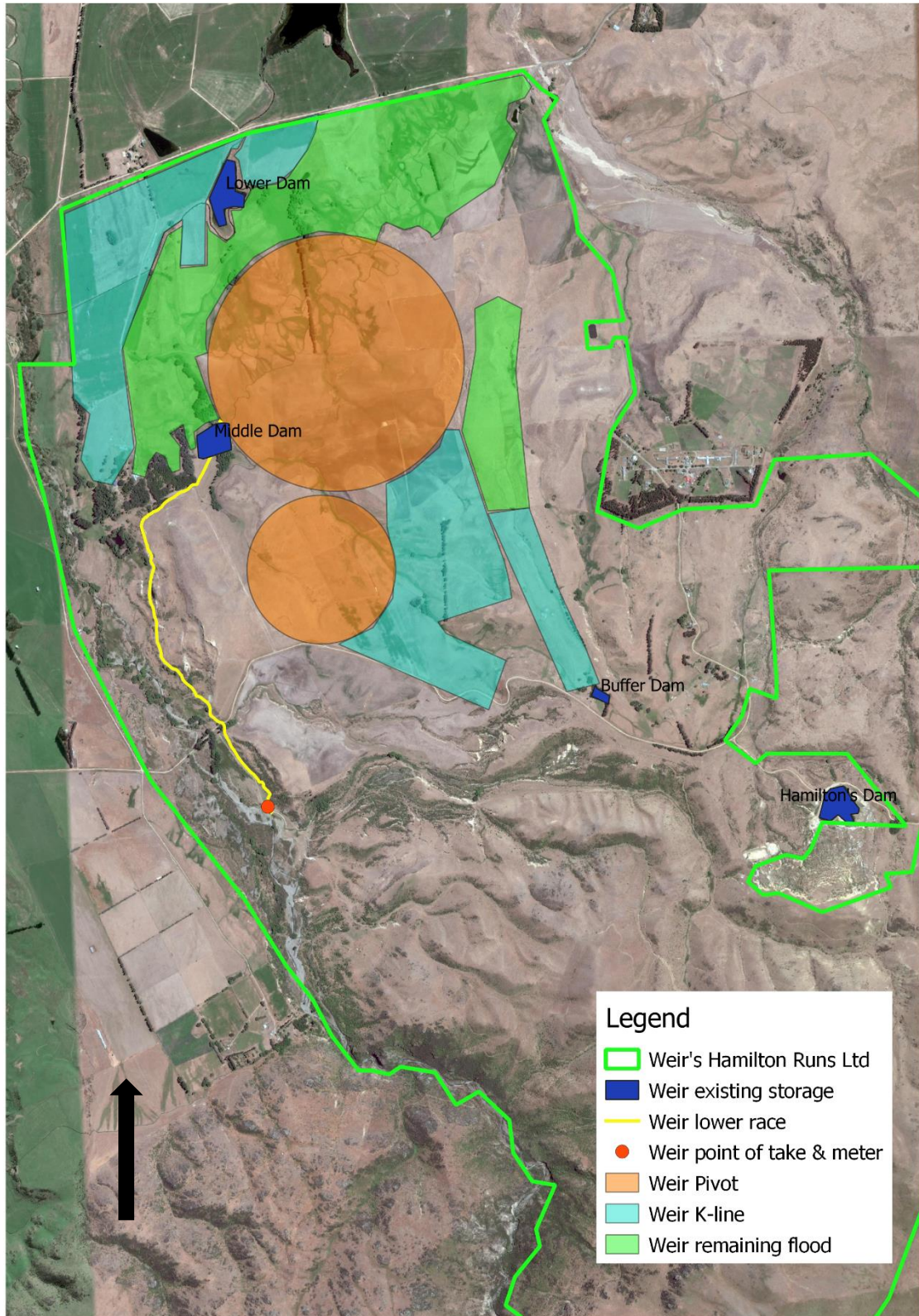


Figure 6: Irrigation on Hamilton Runs Ltd

As with all farms under-going development, these plans take time to come to fruition, and require balancing farm income with investigation and development costs. A neighbouring property was recently purchased with the intent that the more productive land in each property could be managed and used collectively, and to maximise production by irrigating efficiently. This provides balance across the whole operation. This investment inevitably impacts the speed at which development occurs.

This family run business is focused on maximising value from its water resource while minimising its impact on the environment, including by replanting trees for shelter and enhancement of amenity and environmental values.

Without this water feed shortages would occur which would require destocking. Winter feed crops and hay paddocks would not grow and staff would need to be laid off due to reduced income.

Table 7. Use of Water by Hamilton Runs Ltd

Information	Property Details								
Size of property	4800 hectares								
Size of area irrigated	<ul style="list-style-type: none"> Currently 380 hectares irrigated with water from Pig Burn and/or Cap Burn 								
Sources of Water	Pig Burn Cap Burn 15 shares from MESIS								
Maximum recorded rate of take (from metering data)	55.6 L/s								
Maximum recorded annual volume (from metering data)	<table> <tr> <td>MESIS (15 shares)</td> <td>90,000m³ (based on share amount)</td> </tr> <tr> <td>Capburn</td> <td>1,540,103m³ (based on consented volume, as was recently replaced)</td> </tr> <tr> <td>Pigburn</td> <td>892,329m³ (based on maximum annual volume)</td> </tr> <tr> <td>Total</td> <td>2,522,432m³</td> </tr> </table>	MESIS (15 shares)	90,000m ³ (based on share amount)	Capburn	1,540,103m ³ (based on consented volume, as was recently replaced)	Pigburn	892,329m ³ (based on maximum annual volume)	Total	2,522,432m³
MESIS (15 shares)	90,000m ³ (based on share amount)								
Capburn	1,540,103m ³ (based on consented volume, as was recently replaced)								
Pigburn	892,329m ³ (based on maximum annual volume)								
Total	2,522,432m³								
Aqualinc calculation of maximum efficient use	2,661,235m ³								
Number of stock	Approximately: <ul style="list-style-type: none"> 7,000 ewes 2,500 hoggets 600-700 cattle 								
Stock drinking water (based on ORC values for efficient stock water in Form 4, F.10)	79,000l/head/day								
Frequency of water take	24 hours per day 7 days per week 4 weeks per month when water is available								

Months during which water is expected to be taken in a dry year	Irrigation water Sept to April when water is available, stock water and domestic water throughout the year										
Months during which water is expected to be taken in an average year	Irrigation water Sept to April when water is available, stock water and domestic water throughout the year										
Part of day water when water will typically be taken:	24 hours										
Does use of water provide recharge back into catchment?	Possible that wild flood may provide some recharge. However progressive shift to spray irrigation has seen (and will continue to result in) a reduction in wild flooding.										
Is take from re-charge or is an augmented take?	No										
Hectares in a day	Variable depending on application depth and pivot speed.										
Existing storage	<table> <tr> <td>Hamilton's Dam</td> <td>50,000-60,000 m³</td> </tr> <tr> <td>Buffer Dam</td> <td>7,000 m³</td> </tr> <tr> <td>Middle Dam</td> <td>23,000-25,000m³</td> </tr> <tr> <td>Lower Dam</td> <td>19,000 – 20,000m³</td> </tr> <tr> <td>Total</td> <td>99,000-112,000 m³</td> </tr> </table>	Hamilton's Dam	50,000-60,000 m ³	Buffer Dam	7,000 m ³	Middle Dam	23,000-25,000m ³	Lower Dam	19,000 – 20,000m ³	Total	99,000-112,000 m ³
Hamilton's Dam	50,000-60,000 m ³										
Buffer Dam	7,000 m ³										
Middle Dam	23,000-25,000m ³										
Lower Dam	19,000 – 20,000m ³										
Total	99,000-112,000 m ³										

2.2.4 Greenbank Pastoral Ltd and Hamiltons Dairy Ltd - Herlihy Family

Greenbank Pastoral is totally owned and operated by the Herlihy family, while they are the majority shareholders in Hamiltons Dairy Ltd. Greenbank Pastoral Ltd has a permit to abstract water from the Pigburn (referred to as the 'Herlihy Gorge Take' or 'Gorge Take'), while Hamiltons Dairy Ltd has a permit to take water further downstream from the Pigburn (referred to as the 'Herlihy Ford Take' or 'Ford Take').

The total area farmed by both companies is 1225ha with a further 76ha leased from the Central Otago District Council. The total area is farmed as three separate units, namely Hamiltons Dairy (351ha), Crieve Dairy (256ha), and Greenbank Grazing (693ha).

In effect there are two stand-alone dairy unit (Hamiltons Dairy and Crieve Dairy), with Greenbank Grazing providing dairy support for cow wintering and raising of all young dairy replacement stock as well as supporting a beef calf raising and beef cattle fattening unit.

These properties source water from MESIS (339 shares) and the Sow Burn (via a permit operated by the Sowburn Water Co Ltd), as well as the Pigburn.

Substantial resources have been invested in irrigation infrastructure over the last 25 years, all aimed at improving efficiency of water use, productivity and reduction of run-off. There are now 624ha

irrigated by centre pivot, with a further 185ha covered by K-line. A 380,000m³ storage dam was commissioned in 2015. In total approximately 950ha is under some form of irrigation.

The Herlihy Gorge Take (Consent 96394)

The Gorge Take is held by Greenbank Pastoral Ltd. This take delivers water for irrigating a block of land known as the “Grahams Block” (133ha), to the east of the Waipiata - Patearoa Road. This is the only source of water for irrigating this block of land, with all water from this permit used exclusively on this land area.

Irrigation is principally by contour flood irrigation with a series of strategically placed races to catch the surface water and redistribute it.

In most seasons up to 42 l/s is abstracted from this take in early spring but it is constrained as flows recede, with the flows available reducing to nothing during the critical early December to early February period during a ‘normal year’.

This means that the volume of water abstracted on an annual basis varies greatly and is very weather/season dependant. The last few seasons have highlighted this – in the 2015/16 season no water was available for abstraction by Christmas 2015 (and remained so until significant rainfall in late January) while in the 2018/19 season water was available at this point of take throughout the season.

The land irrigated with water from the Gorge Take is healthy stock country. In the spring it is stocked with dairy heifers as they come off winter crop grown elsewhere. The irrigation produces an explosion of feed in the late spring that is harvested as silage for platform feeding on Hamiltons Dairy and Crieve Dairy during the shoulder of the milking season. The feed generated by water from the Gorge Take is a valuable part of the Herlihy’s overall farming enterprise.

Storage of this water has been investigated with sites surveyed and materials tested. Extensive investigations of the only potential feasible site found that the materials were totally unsuitable for the construction of any proposed dam. The very constricted availability of good flows of water at this point of take (6 weeks at the most), means that water harvesting and the investment of more efficient infrastructure (such as pivots) is not economically viable for this point of take. Alternative sources have also been investigated, including drilling a test bore down to 160m in 2015 (at a cost of \$35,000), but this did not find usable quantities of water.

In summary, water is reliably available only until late November. There are a lack of viable storage options. Conversion to spray irrigation is not economically viable currently as spray irrigation relies on a constant, reliable supply of water. Conversely, the existing contour irrigation is an effective use of this water – it enables irrigation to occur, and feed to be produced, based on the availability of the water. Water quality is not adversely affected by this flood irrigation as any potential run-off is captured and re-used.

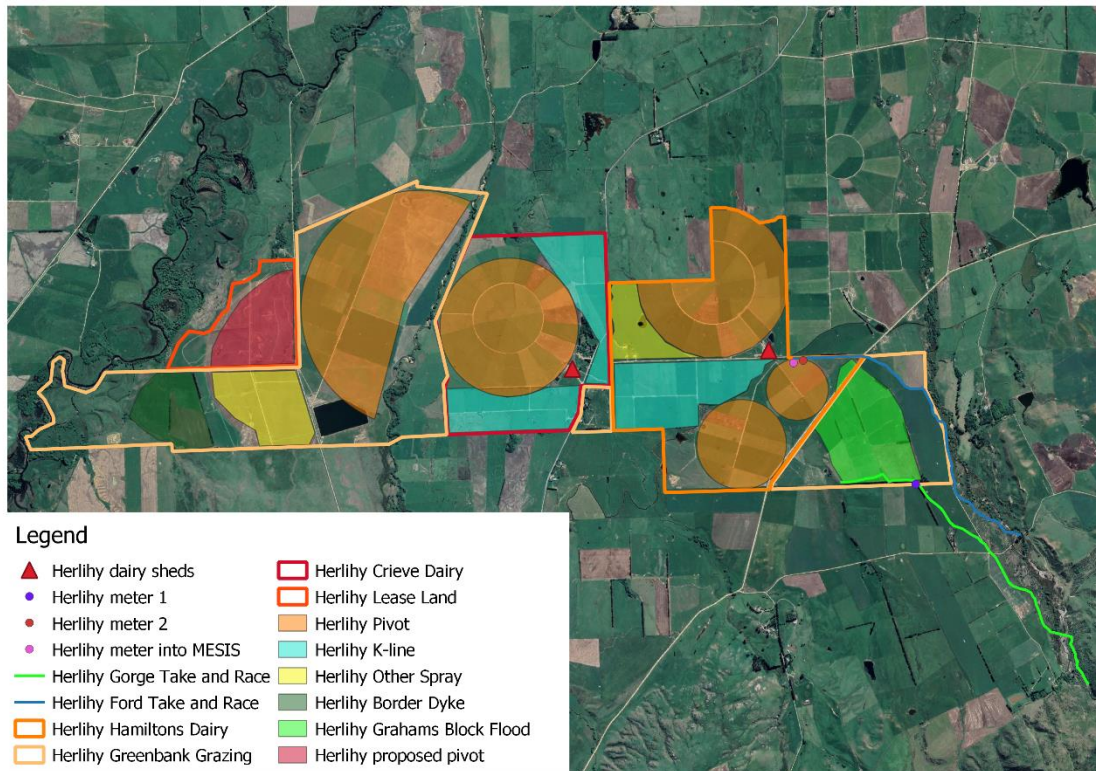


Figure 7: Irrigation on Herlihy properties and associated infrastructure (points of take at start of races in Pigburn)

The Ford Take (Consent 96230.V1)

The Ford Take is held by Hamilton’s Dairy Ltd. This water forms a valuable part of the overall water resource on Hamiltons Dairy, Crieve Dairy, and Greenbank Grazing.

The water from the Ford Take is combined with the rest of the water available to these farms (excluding the water from The Gorge Take which is only used to irrigate Grahams Block – which is part of Greenbank Grazing but which is isolated in terms of water use) and is used over the three farms. Water taken from the Ford Take is dropped into the MESIC race and is measured just before it drops into this race. The use of the MESIC race allows for effective conveyance of the water around the properties.

Immediately following each “irrigation roster” (a 20-day period) a “usage reconciliation” has to be supplied to the MESIS’s race-man, to establish use in that 20-day period. During drier periods the least efficient irrigation (border dyke) is discontinued. The contribution of water from the Ford Take is acknowledged in this usage reconciliation as credits by the MESIS.

The Ford Take from the Pigburn makes a very important contribution to these farms’ overall water resource during each 20-day roster period during the irrigation season.

The full amount permitted to be taken at the Ford Take is only available for the short period during the snow melt from mid-September to early November. A new 380,000m³ storage dam has recently

been constructed adjacent to Maniototo Road. Water from MESIC is used to top up storage, and this enables water from the Pig Burn to be used on the farm while water from the Pig Burn is still reliable and readily available.

There are three generations of the Herlihy family supported by their farming business in the Patearoa area.

Table 8. Use of Water on Herlihy properties

Irrigation Information									
Size of property	Total 1300 hectares, split between 3 farms: <ul style="list-style-type: none"> • Hamiltons Dairy - 351 ha • Crieve Dairy - 256 ha • Greenbank Grazing - 693 ha 								
Size of area irrigated	Grahams Block – 70ha Hamilton Dairy, Crieve Dairy, Greenbank Grazing – 875ha								
Sources of Water	<p>Grahams Block <i>Pigburn:</i></p> <ul style="list-style-type: none"> • The Gorge Take: primarily available in spring. Long periods in the summer/autumn when no water is available. <p>Hamilton Dairy, Crieve Dairy, Greenbank Grazing: <i>Pigburn</i></p> <ul style="list-style-type: none"> • The Ford Take (long periods in the summer when little water is available). <p><i>MESIS:</i></p> <ul style="list-style-type: none"> • 339 shares • 60 shares leased from CODC <p><i>Sowburn</i></p> <ul style="list-style-type: none"> • 74 l/s (Site C) – reliable • 30 l/s (Site D) – not reliable 								
Maximum recorded rate of take (from metering data)	Gorge Take: 42l/s Ford Take: 92l/s - higher flow only available in the spring. Long periods in the summer/autumn when no water is available								
Maximum recorded annual volumes	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 40%;">The Gorge Take:</td> <td style="text-align: right;">454,118m³ (based on monitoring data)</td> </tr> <tr> <td>The Ford Take:</td> <td style="text-align: right;">459,875m³ (based on monitoring data)</td> </tr> <tr> <td>MESIC shares:</td> <td style="text-align: right;">2,394,000m³ (based on share allocation)</td> </tr> <tr> <td>Sowburn:</td> <td style="text-align: right;">1,489,973m³ (based on consented volume)</td> </tr> </table>	The Gorge Take:	454,118m ³ (based on monitoring data)	The Ford Take:	459,875m ³ (based on monitoring data)	MESIC shares:	2,394,000m ³ (based on share allocation)	Sowburn:	1,489,973m ³ (based on consented volume)
The Gorge Take:	454,118m ³ (based on monitoring data)								
The Ford Take:	459,875m ³ (based on monitoring data)								
MESIC shares:	2,394,000m ³ (based on share allocation)								
Sowburn:	1,489,973m ³ (based on consented volume)								

	Total 4,797,966m ³ (note for the purposes of this assessment the Gorge take is included in the total annual volume)												
Aqualinc calculation of maximum efficient use	6,127,411m ³ (Note – for the purposes of this assessment the area irrigated by water from the Gorge Take is included in the total area irrigated to calculate this amount).												
Number of stock	Stock numbers for all 3 farms: <ul style="list-style-type: none"> • 1600 Dairy Cows • 40 Dairy Heifers • 400 Beef Calves • 400 Beef Yearlings • 400 Beef 2 year olds 												
Stock drinking water and dairy shed use (based on ORC values for efficient stock water in Form 4, F.10)	<table> <tr> <td>Dairy Cows</td> <td>1,640 x 70L/day</td> <td>114,800</td> </tr> <tr> <td>Beef Cattle</td> <td>1,200 x 40L/day</td> <td>48,000</td> </tr> <tr> <td>Dairy Shed</td> <td>1,640 x 50L/day</td> <td>82,000</td> </tr> <tr> <td>Total:</td> <td></td> <td>244,800 L/ day 3 L/s and 89,352m³/year</td> </tr> </table>	Dairy Cows	1,640 x 70L/day	114,800	Beef Cattle	1,200 x 40L/day	48,000	Dairy Shed	1,640 x 50L/day	82,000	Total:		244,800 L/ day 3 L/s and 89,352m ³ /year
Dairy Cows	1,640 x 70L/day	114,800											
Beef Cattle	1,200 x 40L/day	48,000											
Dairy Shed	1,640 x 50L/day	82,000											
Total:		244,800 L/ day 3 L/s and 89,352m ³ /year											
Frequency of water take	24 hours a day, 7 days a week												
Months during which water is expected to be taken in a dry year	Sept to Nov for irrigation												
Months during which water is expected to be taken in an average year	Sept to December for irrigation												
Part of day water when water will typically be taken:	24 hours per day when water is available												
Does use of water provide recharge back into catchment?	No												
Is take from re-charge or is an augmented take?	No												
Hectares in a day	Variable depending on application depth and pivot speed.												
Storage	380,000m ³												

2.2.5 Mulholland

The Mulhollands own and operate their farm, known as Brechen, which is situated on the valley floor straddling the Ranfurly –Patearoa Road.

It is a sheep and beef farm which utilises irrigation for pasture growth including winter feed crops.

Historically Brechen has been irrigated using contour flood and have made the most of water when it is available. However, the applicant is aware of the need to increase efficiency of use and is investing in two pivots and storage on their property. Two pivots are proposed to the north of the Ranfurly-Patearoa Road, with a total area of approximately 100 hectares. The first pivot to be installed will be the larger of the pivots shown in Figure 9 below and will irrigate approximately 70 hectares. These developments are proposed to occur within the next 5 years, if this permit is replaced with sufficient allocation as applied for. Further development of spray irrigation is likely to occur after that, with 2 other possible pivot locations identified (between 100 and 150 ha is possible). The balance may remain in contour flood.

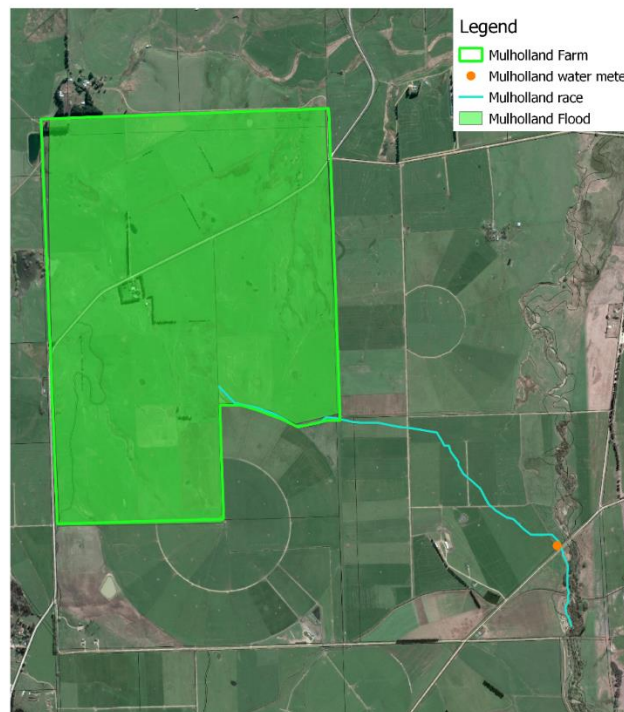


Figure 8: Existing irrigation on Brechan (point of take at start of race)

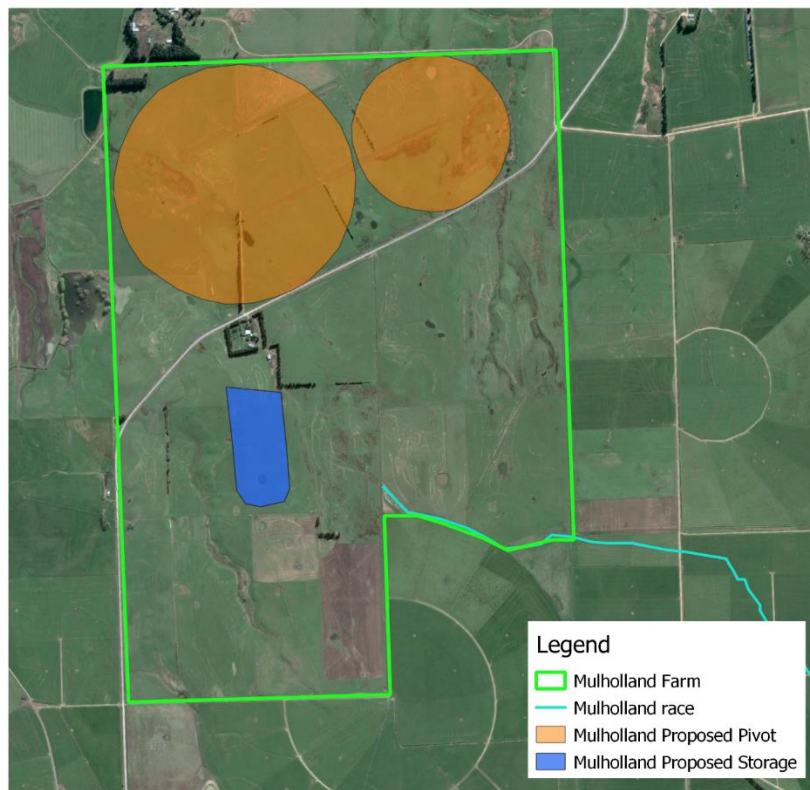


Figure 9: Proposed Irrigation and Storage on Brechan (note that race location may change as a result of infrastructure changes associated with Proposed Combined Take)

To provide sufficient reliability of supply to operate and justify the investment in these pivots, the applicant is also developing a storage dam which will be approximately 6 to 8 hectares in area with a capacity of between 120,000m³. A separate application will be submitted for this dam, which is still being designed.

The Mulhollands source water from both the Pig Burn and the Maniototo East Side Irrigation Scheme, and can irrigate with water from either source.

Water is taken via a channel into an open race and is gravity fed. A monitoring device was installed by Water Force approximately 450 metres from the point of take and is located on a neighbouring property. The monitoring was installed at this point to avoid a flood prone section of the race.

By-wash from flood irrigation on a neighbouring property occasionally results in extra water entering the Mulholland's race. It is obvious when this has happened as flows in the Pig Burn (which fall away quickly) do not match the amount of water being recorded in the Mulholland's device. In the past the Mulhollands have been asked to contact the ORC to let staff there know that this is occurring. This issue is expected to diminish over time as spray irrigation methods take over from flood irrigation.

Table 9. Mulholland Water Use

Irrigation Information							
Size of property	340 hectares						
Size of area irrigated	320 hectares - with Pigburn and MESIS water						
Sources of Water	Pig Burn MESIS						
Maximum recorded rate of take (from metering data)	55.6 l/s						
Maximum recorded annual volumes	<table border="0"> <tr> <td>Pigburn</td> <td>768,614m³ (based on monitoring data)</td> </tr> <tr> <td>MESIS</td> <td>960,000m³ (based on share allocation)</td> </tr> <tr> <td>Total:</td> <td>1,728,614m³</td> </tr> </table>	Pigburn	768,614m ³ (based on monitoring data)	MESIS	960,000m ³ (based on share allocation)	Total:	1,728,614m ³
Pigburn	768,614m ³ (based on monitoring data)						
MESIS	960,000m ³ (based on share allocation)						
Total:	1,728,614m ³						
Aqualinc calculation of maximum efficient use	2,490,000m ³						
Number of stock	Approximately: <ul style="list-style-type: none"> • 2,500 sheep • 60-100 cattle 						
Stock drinking water (based on ORC values for efficient stock water in Form 4, F.10)	17,000 l/head/day						
Frequency of water take	24 hours per day 7 days per week 4 weeks per month						
Hectares in a day	Variable						
Months during which water is expected to be taken in a dry year	Sept to Nov for irrigation, but stockwater at all times						
Months during which water is expected to be taken in an average year	Sept to December for irrigation, but stockwater at all times						
Part of day water when water will typically be taken:	24 hours per day when water is available						
Does use of water provide recharge back into catchment?	Some recharge may occur as a result of contour flood irrigation						
Is take from re-charge or is an augmented take?	No						
Storage	Proposed approximately 120,000m ³						

2.2.6 Concept Farms Ltd

Concept Farms Ltd is a family company owned by Greg and Kelly Kirkwood. They operate three farms located adjacent to the Pig Burn and the Taieri River: Vance, Roseneath and Ryders Terrace Farms.

Each of these farms has its own dairy shed. Part of both the Roseneath and Ryders Terrace Farms are leased land (160 ha of leased land in total). The company has a separate runoff block known as Edenbank that is situated elsewhere in the Maniototo.

Water for the properties that are subject to this application is sourced from MESIC (303 shares) and two water rights to abstract from the Pigburn. The leased land is also irrigated with water held by the owner of the land (Gary Hore), with 150 shares from MESIC.

The take referred to as Concept South is located upstream of the applicant's property and is conveyed via an open channel and is gravity fed along an open race into the MESIC Race above the Mathias Dam (this point is where the Concept south race in Figure 10 stops). No irrigation occurs with this water prior to it being delivered to the MESIC race. This water is measured just before it drops into the MESIC Race. The allocation from MESIC held by Concept Farms and Hores is taken together from the MESIC Race but is metered separately.

As a result of Pig Burn water from Concept South being dropped into the MESIC Race, Concept Farms is given scheme credits, as with the water from the Herlihy Ford Take. During the irrigation season this means that they can take up to around 200-220 l/s from the MESIC Race instead of the 180-200 l/s that they would only be entitled to without adding the Pig Burn Water to the MESIC Race.

The second abstraction from the Pig Burn occurs at the Concept North take point. This take is also via an open channel and is metered 50 metres downstream of the intake. Water is conveyed along an open race to a pump shed on Ryders Terrace where it is combined with MESIC water and then used to irrigate with k-line.

Irrigation on Ryders Terrace Farm is currently via k-line.

The portion of leased land on Ryders and Roseneath is irrigated using 1 big (97 hectares) and 3 small pivots (50 hectares in total for the small pivots), with approximately 13 hectares of k-line used to irrigate the area around the pivots. At present this system can only run at about 70% of capacity due to amount of water available on the property from Gary Hore's MESIC share allocation. As a result Concept Farms utilises its own water, sourced from both the Pig Burn and MESIC to supplement water on this leased land, which results in either 1 big pivot and 1 small pivot running at the same time (110 ha total) or 3 small pivots and the k-line running (65 ha total) at the same time. On Vance irrigation is carried out by 4 pivots with 30 ha of k-line around these pivots.

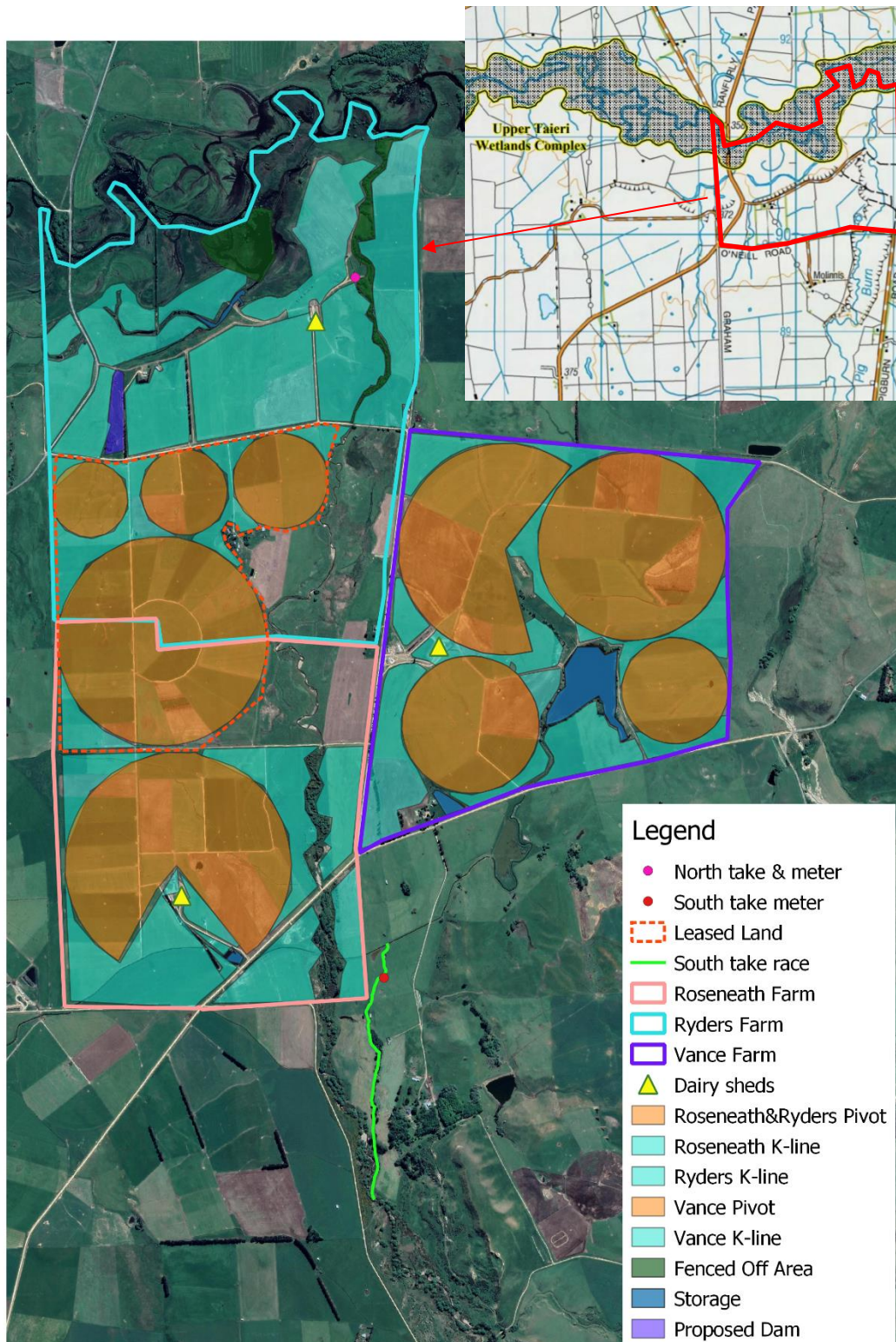


Figure 10: Concept Farms Ltd – Irrigation and associated infrastructure, with inset showing boundary of Upper Taieri Wetlands Complex in relation to upper portion of Ryders Farm (source of inset: Map F20 of ORC RPW) (point of take at start of race in Pigburn).

Concept Farms' Ryders Terrace is situated adjacent to the Taieri River and incorporates part of the Upper Taieri Wetlands Complex, a regionally significant wetland. Large areas of wetland within Ryders Terrace as well as other waterways within Concept Farms are fenced off (as shown in Figure 10), and no irrigation occurs within the regionally significant wetland. Some native planting has occurred within these areas and there is a strong commitment within the company to carry out more of this over the next two years.

Table 10. Concept Farms Ltd Use of Water from Concept South and Concept North Takes

Irrigation Information																
Size of property	869ha (all three farms, including lease land of 160ha)															
Size of area irrigated	760ha															
Sources of Water	Pig Burn Maniototo East Side Irrigation Scheme (303 shares, plus 150 shares from Gary Hore lease property, total of 453 shares with 1 share used to irrigate 1.25 ha)															
Maximum recorded rate of take (from metering data)	Concept South: 55.6/s in combination with Mulholland Take Concept North: 42l/s															
Maximum recorded annual volume (from metering data)	<table border="0"> <tr> <td>Concept South</td> <td>920,652m³ (based on monitoring data)</td> </tr> <tr> <td>Concept North</td> <td>1,697,661m³ (based on monitoring data)</td> </tr> <tr> <td>MESIS</td> <td>2,718,000m³ (based on share allocation)</td> </tr> <tr> <td>Total</td> <td>5,336,313m³</td> </tr> </table>	Concept South	920,652m ³ (based on monitoring data)	Concept North	1,697,661m ³ (based on monitoring data)	MESIS	2,718,000m ³ (based on share allocation)	Total	5,336,313m ³							
Concept South	920,652m ³ (based on monitoring data)															
Concept North	1,697,661m ³ (based on monitoring data)															
MESIS	2,718,000m ³ (based on share allocation)															
Total	5,336,313m ³															
Aqualinc calculation of maximum efficient use	5,761,330m ³															
Number of stock	2480 cross breed cows															
Stock drinking water and dairy shed use (based on ORC values for efficient stock water in Form 4, F.10)	<table border="0"> <tr> <td colspan="3">297,600 l/head/day</td> </tr> <tr> <td>Dairy cows:</td> <td>2480 x 70L/head/day</td> <td>173,600L/head/day</td> </tr> <tr> <td>Dairy Shed:</td> <td>2480 x 50L/head/day</td> <td>124,000L/head/day</td> </tr> <tr> <td>Total:</td> <td></td> <td>297,600L/head/day</td> </tr> <tr> <td></td> <td></td> <td>3.5L/s and 108,624m³/year</td> </tr> </table>	297,600 l/head/day			Dairy cows:	2480 x 70L/head/day	173,600L/head/day	Dairy Shed:	2480 x 50L/head/day	124,000L/head/day	Total:		297,600L/head/day			3.5L/s and 108,624m ³ /year
297,600 l/head/day																
Dairy cows:	2480 x 70L/head/day	173,600L/head/day														
Dairy Shed:	2480 x 50L/head/day	124,000L/head/day														
Total:		297,600L/head/day														
		3.5L/s and 108,624m ³ /year														
Frequency of water take	24 hours per day 7 days per week 4 weeks per month															
Months during which water is expected to be taken in a dry year	Sept – May inclusive, regardless of year															
Months during which water is expected to be taken in an average year	Sept – May inclusive, regardless of year															
Part of day water when water will typically be taken:	24 hours															

Does use of water provide recharge back into catchment?	Unlikley as all spray irrigation
Is take from re-charge or is an augmented take?	No
Storage	350,000m ³ (across 4 dams)

2.2.7 Proposed Combined Intake – Herlihy, Mulholland and Concept

The collection and assessment of hydrological and ecological information in support of this application, in combination with the informal group approach taken by the applicants has resulted in the development of a proposal to establish a new combined intake.

This application proposes a combined use of the existing take point for the Concept South Take. This combined take point (referred to in this application as the “Proposed Combined Take”) would:

1. Move the Mulholland Take to the location of the existing Concept South Takes – the Mulholland existing take point would no longer be used for the abstraction of primary allocation water. This application does not seek to replace the existing Mulholland take point, or primary allocation abstraction at that point.
2. Continued use of the Herlihy Ford Take (only during high to moderate flows). This application seeks to replace this take point on this basis.
3. During high to moderate flows:
 - a. the Mulholland and Concept South allocation would be abstracted at the Proposed Combined Take at an equal ratio.
 - b. The Herlihy Ford allocation would be abstracted from the existing Herlihy Ford take point
4. At times of low flows:
 - a. the Herlihy Ford, Mulholland and Concept South allocation would be abstracted from the Proposed Combined Take at a 40:30:30% ratio respectively.
 - b. No water would be abstracted from the Herlihy Ford Take point.
5. Water taken at the Proposed Combined Take would be shared between the permit holders abstracting at that point.
6. The rate of take from the Proposed Combined Take would be capped at 60 l/s at all times.

This re-configuration of take infrastructure, amalgamation of abstraction and capping of the rate of abstraction is proposed to provide effective mitigation of the effects of abstraction in the lower reaches of the Pigburn. This proposal would ensure higher flows remain in this section of the Pigburn to prevent dewatering of this reach, as explained in more detail in Appendix C and Section 8 of this application.

This proposal requires significant commitment and capital expenditure by the affected applicants, and represents a willingness to work collectively for the enhancement of the Pigburn. Because of the capital expenditure required, this proposal will only be possible if a long-term permit is granted.

The Proposed Combined Take negates the need for low flow sharing (and thus also the need for a Water Management Group). This is because it combines the 3 takes that would have been most suited for low flow sharing, due to the location of these takes in relation to losing reaches of the lower Pigburn. Combining these takes effectively requires sharing to occur between these 3 abstractors during times of low flows. Residual flows and compliance with the minimum flow at Waipiata effectively limits abstraction at times of low flows, as irrigators reduce their rates of takes as flows drop towards these limits.

2.2.8 Water monitoring

Most of the applicants have 3 or more seasons of water data. The deadline for installing a measuring device for En Hakkore (Bradfields take) was 10 November 2016, due to the small size of the abstraction. Accordingly, that take has fewer seasons of data.

The applicants' history of use in support of this application is based on the water metering records sent to Council electronically or recorded on file by Council with historical water use summarised and assessed.

Besides metering data, history of use is also established by the area irrigated with this water, maps showing this and photos showing the use of this water (see Appendix B for examples of use of water). The combination of all this information establishes a clear history of use of the water from all the Take Points from the Pig Burn.

The intake structure and monitoring of the abstractions from the Pig Burn are summarised in Table 11.

Table 11. Details of intake structures and monitoring of water takes

Take	Intake Structure	Measuring device	Proof of installation previously supplied to ORC	Exemption required for not being at point of take	WEX secured?	Proof of use
Shared permit	Piped	Measuring installed with datalogger	Yes	Yes	Yes WEX0238	<ul style="list-style-type: none"> • 4 years of data • Irrigated area • maps • Photos
Bradfield (En Hakkore Ltd)	Piped	Ultrasonic measuring device in place with trutrack	Yes	Yes	Yes WEX0232	<ul style="list-style-type: none"> • 2 years of data • Irrigated area • Maps • Photos

		datalogger. No telemetry in place, due to lack of coverage at the site.				
Herlihy Gorge	Open channel	Measuring installed with datalogger	Yes	Yes	Yes WEX0063	<ul style="list-style-type: none"> • 5 + years of data • Irrigated area • Maps • Photos
Weirs (Hamilton Runs Limited)	Pipe to open race	Measuring installed with datalogger	Yes	No – within 100m	N/A	<ul style="list-style-type: none"> • 5 years + of data • Irrigated area • Maps • Photos
Herlihy Ford	Open channel	Measuring installed with datalogger.	Yes	Yes	Yes WEX0062	<ul style="list-style-type: none"> • 5 + years of data • Irrigated area • Maps • Photos
Concept South	Open channel	Measuring installed and telemetered data being sent to Council.	Yes	Yes measured before entering MESIS race.	Yes WEX0168	<ul style="list-style-type: none"> • 5 + years of data • Irrigated area • Maps • Photos
Mulholland	Open channel	Measuring installed and telemetered data being sent to Council.	Yes	Yes	Yes WEX0049	<ul style="list-style-type: none"> • 5 + years of data • Irrigated area • Maps • Photos
Concept North	Open channel	Measuring installed and telemetered data being sent to Council.	Yes	No, within 100 m of intake	N/A	<ul style="list-style-type: none"> • 5 + years of data • Irrigated area • Maps • Photos

The metering data for the applicants shows the maximum rates and volumes contained in Table 12. Maximum figures are determined based on analysis of data in excel spreadsheets, with the data being sourced from the ORC. This data has not been error corrected, unless obvious errors (such as single spikes in rates of take) can be very simply removed. Where an error has been corrected or excluded from the analysis this is noted in the table below.

Table 12. Maximum rates and volumes based on metering data

Consent holder	Maximum Rate of Take (l/s)	Year Recorded	Maximum Monthly Volume (m ³ / month)	Year Recorded	Maximum Annual Volume (m ³ / year)	Year Recorded
Shared permit	99	2018	145,305.1	Oct 2016	495,471.70	2016-17
En Hakkore Ltd [Bradfield]	7.172	2018	16,522.67	Aug 2018 (data after Sept 18 not available at time of writing)	68,123.30	2017-18
Herlihy Gorge	173.5	2015	103,161 (exceedances excluded)	Nov 2008	454,118 (next highest is 447,684)	2008-09 (next highest year 2018-19)
Hamilton Runs Limited [Weirs]	115.356	2018	301,285.8	Aug 2018	892,329	2018-19
Herlihy Ford	91.4 (Single exceedance 128l/s removed)	2018	157,519	Oct 2018	459,875	2018-19
Concept South	153.72	2012	482,435.627	Oct 2007	920,652.00	2016-17
Mulholland	115.356	2015	144,000	Dec 2012	768,614.00 (next highest year 740,862)	2011-12 (next highest 2012-13)
Concept North	115.356	2016 to 2019	304,336.9	Aug 2017	1,697,661.10	2016-17

3. Environmental Setting

3.1 The Pig Burn

The Pigburn is a tributary of the Taieri River and has its origins in the tops of the north western end of the Rock and Pillar Range. Its confluence with the Taieri River is 3km downstream of the Ranfurly-Patearoa Road Bridge, upstream of the ORC flow monitoring site at Waipiata.

The Pig Burn catchment is 50.8km², with the highest point in the catchment at 1324 metres. The upper sections of the Pigburn is characterised by confined gorges until it reaches the foothills of the Rock and Pillar Ranges. Below these foothills the Pig Burn flows across the Maniototo Plain before entering the Taieri River.

Table 13. Overview of indicative characteristics of Pig Burn

Characteristic	Indicative characteristics at points of take (all depth and width figures are approximate)
Type of Waterbody	Stream
Average channel width and depth upstream of the point of take (approx. 20 m)	<ul style="list-style-type: none"> • Shared Take Pigburn: 1m wide x 10-20cm deep • Shared Discharge: 1m wide x 10-20cm deep • Shared Take Harpers: 1m wide x 10-20cm deep • En Hakkore Take: 3-4m wide x 30cm-1m deep • Herlihy Gorge Take: 2m wide x 20cm deep • Weir Take: 2-3m wide x 20cm deep • Herlihy Ford Take: 3m wide x 15cm deep • Proposed Combined Take: 2.5 m wide x 20cm deep • Concept North Take: 1m wide x 10-30cm deep
Average channel width and depth at point of take	<ul style="list-style-type: none"> • Shared Take Pigburn: 1m wide x 10-20cm deep • Shared Discharge: 1m wide x 10-20cm deep • Shared Take Harpers: 1m wide x 10-20cm deep • En Hakkore Take: 3m wide x 30cm-1m deep • Herlihy Gorge Take: 1.5m wide x 20cm deep • Weir Take: 3-4m wide x 40cm deep • Herlihy Ford Take: 1.5m wide x 20cm deep • Proposed Combined Take: 2.5m wide x 20cm deep • Concept North Take: 1m wide x 45cm deep
Average channel width and depth downstream of the point of take (approx. 20 m)	<ul style="list-style-type: none"> • Shared Take Pigburn: 1m wide x 10-20cm deep • Share Discharge: 1m wide x 10-20cm deep • Shared Take Harpers: 1m wide x 10-20cm deep • En Hakkore Take: 3-4m wide x 30cm-1m deep • Herlihy Gorge Take: 1.5m wide x 20cm deep • Weir Take: 2-3m wide x 20cm deep • Herlihy Ford Take: 1.5m wide x 20cm deep • Proposed Combined Take: 2m wide x 10cm deep • Concept North Take: 1m wide x 20cm deep
Average flow water velocity including	As outlined in Appendix C

source of flow data and any changes to flow velocity above and below the point of take	
Any flow gauging of the water body. A flow gauging report with photographs of the site and methodology to be attached.	As outlined in Appendix C. Flow gauging undertaken by ORC staff, this information is held by the ORC.
Bed of the water body upstream of the point of take	<ul style="list-style-type: none"> • Shared Take Pigburn: Cobbles, gravels • Share Discharge Sandy, cobbles • Shared Take Harpers: Cobbles, gravels, sandy • En Hakkore Take: Boulders and cobbles • Herlihy Gorge Take: Stony/boulders • Hamilton Runs Take: Stony, gravels, sandy • Herlihy Ford Take: Stony • Mulholland Take: Stony, gravels, sandy • Concept Take: Stony, cobbles, gravels
Bed of the water body at the point of take	<ul style="list-style-type: none"> • Shared Take Pigburn: Cobbles, gravels • Share Discharge Sandy, cobbles • Shared Take Harpers: Cobbles, gravels, sandy • En Hakkore Take: Boulders and cobbles • Herlihy Gorge Take: Stony/boulders • Hamilton Runs Take: Stony, gravels, sandy • Herlihy Ford Take: Stony, gravels, sandy • Mulholland Take: Stony, gravels, sandy • Concept Take: Stony, gravels, sandy
Bed of the water body downstream of the point of take	<ul style="list-style-type: none"> • Shared Take Pigburn: Cobbles, gravels • Share Discharge Sandy, cobbles • Shared Take Harpers: Cobbles, gravels, sandy • En Hakkore Take: Boulders and cobbles • Herlihy Gorge Take: Stony/boulders • Hamilton Runs Take: Stony, gravels, sandy • Herlihy Ford Take: Stony • Mulholland Take: Stony, gravels, sandy • Concept Take: Stony, cobbles, gravels
Minimum flow rates	2 – 10 l/s
Maximum flow rates	1000 l/s +
Natural 7-day Mean Annual Low Flow	53 L/s (Pigburn Gorge Flow site)
Source of Flow Data	Observations, ORC gauged flows, take data, please refer to Appendix C

3.1.1 Hydrology of the Pig Burn

Flows in the Pigburn vary greatly between the summer period and the remainder of the year. Winter and spring flows are higher, fed by rainfall and snowmelt in the upper catchment. These higher flows drop off markedly as summer approaches. Flows during the irrigation season can recover if there is a significant rain event. The hydrology of the Pig Burn was observed by permit holders (Appendix D) and is assessed in more detail in Appendix C to this document.

Typically, during the irrigation season flows in the Pigburn are low, with numerous drying reaches after the Pigburn leaves the Rock and Pillar Range and flows across the foothills and Maniototo Plains. The Pigburn is prone to major floods when easterly rains prevail in the Rock and Pillar Range.

The shared take is the most upstream take in the catchment, as it is in the headwaters of the Pigburn, near the top of the Rock and Pillar Range. Observations by the holders of this permit are that surface water will remain in the Pigburn at and below this point of take, even during dry periods. Due to the small amount abstracted at this point of take and the distance water is conveyed, race losses mean that water does not make it to the re-take point from Harpers Creek during the height of the irrigation season. After leaving the top of the Rock and Pillar Range the upper Pigburn flows through a confined gorge, with no obvious gaining or losing reaches.

Flows within the Pigburn gorge are reliable but relatively small during the summer. The Bradfield take is located in the gorge – this take is reliable, but this is partly because it is very small. Summer low flows can be as low as 31 l/s and are often less than 50 l/s in the Pig Burn upstream of the majority of takes (Appendix C).

From the end of the gorge to the confluence with the Taieri River the Pigburn has several losing and gaining reaches (refer to Appendix C). Most abstraction occurs at or below the base of the gorge, and are therefore impacted by, or can impact these losing and gaining reaches. Once flows in the Pigburn reach approximately 55 to 60L/s continuous surface flows are unlikely to be maintained.

3.2 Climate

The climate in the Upper Taieri is characterised by hot, dry summers and cold winters. Farms reliant on Pig Burn water can experience frequent seasonal droughts.

Rainfall is low and can be unreliable, particularly in the summer. The annual median for rainfall differs little from the rainfall in a dry year (350mm – 400mm as compared to 300 – 350 mm on the valley floor). While rainfall is higher in the headwaters of the Pig Burn, it is still not sufficient to sustain flows in the lower reaches of the Pig Burn throughout the summer.

Mean annual rainfall for the Pigburn irrigated area is shown in Figure 11 below.

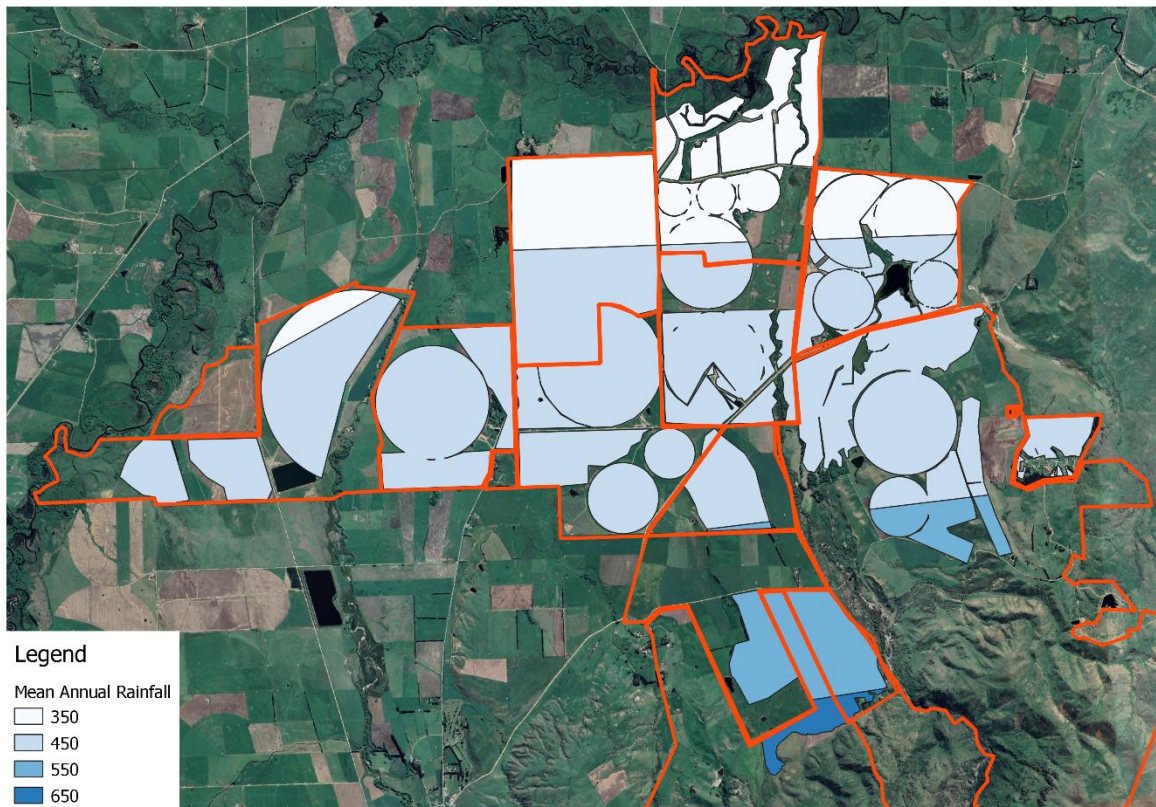


Figure 11: Mean Annual Rainfall Values for Areas Irrigated with Pigburn Water

3.3 Soil types

Soils within the irrigated areas include semi-arid soils and podzol soils. Soils are dominated by shallow fine sandy loams, as well as silt loam.

Profile available water for soils within the irrigated areas are shown in Figure 12 below.



Figure 12: PAW Values for Areas Irrigated with Pigburn Water (using PAW mid values from the Aqualinc PAW values)

4. Allocation

The Otago Regional Council commissioned Aqualinc Research Ltd to develop guidelines for reasonable daily and seasonal irrigation water requirement in Otago. These were updated in 2017 (Aqualinc, 2017, referred to here as the Aqualinc guidelines). The updated Aqualinc guidelines are based on climate, mean annual rainfall, profile available water (related to soil types) and land use type to determine (as a desktop exercise) reasonable irrigation water requirements for a particular property.

The irrigation areas on each of the applicants' properties have been mapped and assessed based on the Aqualinc guidelines utilising the mean annual rainfall and profile available water data utilised by Aqualinc (please refer to Appendix E for an overview of the methodology used). This has been compared with the water use on the applicant's properties to determine whether their current use is considered reasonable.

Several of the applicants irrigate with water from a combination of sources. This includes the Maniototo East Side Irrigation Scheme, and water taken from the Sowburn and Capburn. The amount of water received from sources other than the Pigburn has been included in the total calculation of water use on the applicant's properties in Table 14 unless the water is used separately from Pigburn water (i.e. on a separate area).

Table 14 compares the Aqualinc guidelines of reasonable water use with the applicant's water use. In this table each applicant's water use is the total of all sources of water where water is used in combination to irrigate areas within the same property or properties. Water abstracted from the Pigburn is a subset of this, and this is detailed in Table 15.

The maximum annual demand volumes from Aqualinc have been used after considering the following factors:

- A large portion of the area irrigated with water from the Pigburn utilises efficient spray irrigation, and the proportion of spray irrigation is proposed to increase.
- Several of the applicants with the most influential takes have actively reduced their instantaneous rates of take, this increases reliability of supply in drier seasons.
- The majority of the permit holders have, or are proposing, storage. Storage allows water users to plan for providing water in dry seasons.
- It is the rate of take that has the greatest potential effect on instream values, not volume. The total rate of take from the Pigburn is proposed to be reduced.
- Residual flows are proposed to protect ecological effects on the Pig Burn. This means that there is no need to also restrict volume during a dry season if the water is available (as would be the case if the Aqualinc 90ile% of annual demand volumes were applied instead
- There is no indication in the Aqualinc report or the RPW that the Aqualinc 90ile% of annual demand should be used.

Table 15 summarises the allocation permitted under existing consent conditions, the maximum recorded rates of take and annual volumes and the proposed allocation sought by this application.

Table 14. Comparison of Total Maximum Recorded Annual Volumes for all water sources on farm/s to Aqualinc reasonable demand

Consent	Consent identifier	Total Max Recorded Annual Volume (all water sources where combined, or held by same permit holder) (m ³)	Aqualinc Maximum Annual Demand for irrigated area for each permit holder's farm/s (m ³)
2000.136 2000.245 2000.244	Pigburn Gorge Ltd / Tearoa / Smith (Shared take)	495,472	1,275,968
2002.0101	En Hakkaore (Bradfields)	70,000	158,342
96394	Herlihy Gorge Take	Total: 4,894,868	6,127,411
96230.V1	Herlihy Ford Take		
97210	Hamilton Runs Ltd Weirs	Total: 2,522,432	2,661,235
97128	Concept South (Concept Farms)	Total: 5,336,313	5,761,330
96254	Concept North (Concept Farms)		
2000.498	Mulholland	Total: 1,728,614	2,490,000

Table 14 shows that the allocation sought by the applicants is within the reasonable irrigation demand anticipated by Aqualinc.

Table 15. Summary of Allocation – Pigburn only (with maximum recorded rates capped at consented rates)

Consent	Consent identifier	Current consent Rate of Take (l/s)	Max recorded Rate of Take (l/s)	Proposed Rate of Take (l/s)	Current consent Annual Volume (m ³)	Max recorded Annual Volume (m ³)	Proposed Annual Volume (m ³)
2000.136 2000.245 2000.244	Pigburn Gorge Ltd / Tearoa / Smith (Shared take)	86	99	56	2,628,000	495,472	500,000
2002.010 1	En Hakkaore (Bradfields)	7	7	7	219,000	70,000	70,000
96394	Herlihy Gorge Take	42	42	42	1,296,000	454,118	454,120
96230.V1	Herlihy Ford Take	111	92	70 From this point of take when residual flow of 70 l/s When no residual of 70 l/s then 60l/s combined total with Mulholland & Concept south at Proposed Combined Take	3,225,600	459,875	459,875
97210	Hamilton Runs Ltd Weirs	55.6	55.6	55.6	1,752,000	892,329	895,000
97128	Concept South	55.6	55.6	60 as combined total with Mulholland	1,752,000	920,652	920,655
96254	Concept North	42	42	42	1,296,000	1,697,661	1,697,665
2000.498	Mulholland	55.6	55.6	60 as combined total with Concept South	1,752,000	768,614	768,615

The amounts specified above in Table 15 include the use of water for stock drinking water and dairy sheds. The use of water for stock drinking and for dairy sheds is based on the efficient value per day per head as set out in the Otago Regional Council's Resource Consent Application Form 4.

Instantaneous rates of abstraction are not proposed to be reduced over time, as these rates of take are critical to supply water when it is available and needed. The rates proposed in Table 15 reflect a significant reduction in historical instantaneous rates of abstraction for the Herlihy Ford, Mulholland and Concept South takes.

5. Existing Investment

Investment in storage and the maintenance and upgrading of irrigation infrastructure, including transition to more efficient application methods in recent years has been considerable by several of the applicants:

- Pigburn Gorge estimate that approximately \$150,000 has been spent to date on infrastructure relating to irrigation on the farm, with future projects estimated to require a further \$60,000 of investment.
- In the 2015-2016 financial year the DCFT spent \$55,000 on the gravity fed k-line scheme on Tearoa for irrigation with water from the Pigburn.
- The Smith family estimate that they have spent \$40,000 on metering devices, maintaining the water race and on-farm infrastructure associated with irrigation in the past few years.
- For En Hakkore (Bradfield family), investment in the last 3 years is estimated to be approximately \$100,000. This includes:
 - 3km of 140mm in 18 meter lengths pipe, joined by electro fused couplings;
 - 2km was buried so digger hire was required; maintenance of track and construction of 3 bridges near intake;
 - On farm – burying a new 500meters x 75mm alkathene pipe, hiring a digger to do this; purchase 10 three-quarter sprinklers; 1000m inch pipe and fittings.

Prior to this approximately \$50,000 was spent on the existing dam. Upcoming investment or costs for En Hakkore will include purchasing of a digger to construct a dam, and fencing of dam.

- The Herlihy's have invested heavily in the last 2 decades in irrigation infrastructure to improve the efficiency of use of their available water resource. Six pivots now irrigate 624ha with a further 185ha irrigated by K-line. Further the three recent pivots installed are fitted with variable rate irrigation technology which results in proven environmental outcomes in the use of this water. The Herlihy's have conservatively estimated that \$5,500,000 has been spent to achieve these efficiencies. In addition, in 2005, the Herlihy's invested in a 380,000m³ storage dam, with a surface area of 8ha, at a cost of a further \$1 million.
- The Weir's have invested approximately \$1,400,000 to date in on farm infrastructure directly associated with irrigation. This includes dams, pivots and redesigning irrigation systems and paddocks.
- The Mulholland's are committed to spend approximately \$500,000 on developing the dam, and a further \$500,000 on pivots and setting up power and pumps to service these pivots. Fencing and reticulation associated with setting up the pivots is expected to be in the range of at least \$50,000.
- Concept Farms estimate that to date they have invested approximately \$750,000 (2009) in 3 pivots, \$100,000 on variable drives and pumps, and \$100,000 on land contouring, fencing and crossings.

This highlights the significant investment made by these farms in ensuring water is used effectively and efficiently.

6. Legislative Analysis

6.1 Resource Management Act

The Resource Management Act provides for the sustainable management of New Zealand's natural resources, and sets out the roles and responsibilities of central and local government in doing so.

Under the s14 of the Resource Management Act the taking and use of surface water can be authorised by a rule in a regional plan or by a resource consent.

6.1.1 Section 104(1) RMA 1991

The matters under Section 104(1) to be considered when assessing an application for a resource consent are as follows:

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)(a)**, the actual and potential environmental effects of the proposed activity are considered in Section 8 of this report. Recommended conditions of consent will ensure that any adverse effects are avoided, remedied or mitigated.

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 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 the applicants are compliant with this requirement.

With regard to **s104(1)(b)(iii)**, the National Policy Statement on Freshwater Management is relevant to this application. The relevant provisions of this document are considered in the following sections.

Under **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 the 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 5 of this document.

6.1.2 Part 2 RMA 1991

For completeness, consideration is given to the ability of the proposal to meet the purpose of the Act, which is to promote sustainable management of natural and physical resources. The relevant sections are set out in Section 5, 6, 7 and 8 of the Act.

s5 Purpose

(1) The purpose of this Act is to promote the sustainable management of natural and physical resources.

(2) In this Act, sustainable management means managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety while—

(a) sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and

(b) safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and

(c) avoiding, remedying, or mitigating any adverse effects of activities on the environment.

With regard to Section 5(2)(a)-(c) the amalgamation of takes, capping of abstraction rates (at the Proposed Combined Take), residual and minimum flows and fish screen will safeguard the life-supporting capacity, ecosystem processes and indigenous species of the Taieri River and its tributaries, as described in the Assessment of Environmental Effects (Section 8) submitted as part of this application.

The applicants seek to replace existing permits to take surface water as primary allocation and the proposed rates and volumes sought represent efficient allocation and use of water. Providing the recommended conditions of consent are imposed, the proposed takes will not adversely impact the ability of the Pigburn and Taieri to meet the reasonably foreseeable needs of future generations, or on the life-supporting capacity of the waterways or any ecosystems associated with them, in a more than minor way.

The proposed taking of water from the Pigburn for various purposes as set out in this application is therefore consistent with the purpose and principles set out in Section 5 of the Act.

6 Matters of national importance

In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall recognise and provide for the following matters of national importance:

(a) the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development:

(b) the protection of outstanding natural features and landscapes from inappropriate subdivision, use, and development:

(c) the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna:

(d) the maintenance and enhancement of public access to and along the coastal marine area, lakes, and rivers:

(e) the relationship of Maori and their culture and traditions with their ancestral lands, water, sites, waahi tapu, and other taonga:

(f) the protection of historic heritage from inappropriate subdivision, use, and development:

(g) the protection of protected customary rights:

(h) the management of significant risks from natural hazards.

With regard to s6(a), the proposed replacement takes are existing activities occurring in a catchment with a long history of water abstraction. The use of the water on these properties is compatible with the pastoral land use that dominates the Maniototo area. On this basis, the continuation of abstraction from the proposed points of take is not anticipated to compromise the natural character or amenity of the Pigburn or Taieri River.

With regard to s6(b) there are no outstanding natural features or landscapes relevant to this application.

With regard to s6(c) it is not anticipated that the proposal will be inconsistent with the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna. Longfin eels are the only indigenous fauna that have been found to be present in the vicinity of the takes. As determined in the Assessment of Environmental Effects, any adverse effects on ecological and instream values as a result of the proposed water takes are anticipated to be minimal, subject to the proposed minimum flow, residual flow and fish screen conditions.

With regard to s6(d) the water takes will not result in any changes to the existing level of public access to and along any water body.

With regard to s6(e), and as established in the Assessment of Environmental Effects, any adverse effects on the values of importance to iwi in the Taieri River and its tributaries are anticipated to be minimal, based on the proposed amalgamation of takes and capping of abstraction rates and the residual and minimum flow and fish screen conditions.

With regard to s6(f), historic heritage is not affected by this application.

With regard to s6(g), there are no known protected customary rights relevant to this application.

With regard to s6(h), there are no known risks from natural hazards relevant to this application.

7. Other matters

In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall have particular regard to—

(a) kaitiakitanga:

(aa) the ethic of stewardship:

(b) the efficient use and development of natural and physical resources:

(ba) the efficiency of the end use of energy:

(c) the maintenance and enhancement of amenity values:

(d) intrinsic values of ecosystems:

(f) maintenance and enhancement of the quality of the environment:

(g) any finite characteristics of natural and physical resources:

(h) the protection of the habitat of trout and salmon:

(i) the effects of climate change:

(j) the benefits to be derived from the use and development of renewable energy.

The application is consistent with the requirements of Section 7 of the Act, with particular regard given to, the efficient use and development of natural and physical resources, maintenance and enhancement of amenity values, intrinsic values of ecosystems maintenance and enhancement of the quality of the environment and the finite characteristics of natural and physical resources. The proposed takes are consistent with these matters, provided recommended consent conditions are adopted.

6.2 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.

Relevant 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.

Under the current regime of abstraction, the Pigburn is home to a range of in-stream ecological values. These values have been impacted in the past by drying out of some reaches that would not go dry naturally. However, these values are also impacted by the natural losing reaches in the Pigburn and the low flows experienced in summer.

The life-supporting capacity, ecosystem processes and indigenous species will be provided for by the mitigation measures outlined in Section 8 of this document, including residual flows (where appropriate), the minimum flow for the Taieri at Waipiata, fish screens and the establishment of the Proposed Combined Take point for the Herlihy Ford, Mulholland and Concept South takes (refer to Section 8.1 for a detailed outline of this proposal), along with a capped rate of abstraction at this take.

Objective B2: To avoid any further over-allocation of fresh water and phase out existing over-allocation.

The instantaneous rate of abstraction for the top takes (Shared Take and Bradfield Take) is not proposed to be reduced – this recognises the limited access to water, or small rate of take from these takes

However, abstraction from the Proposed Combined Take will represent a significant reduction from historic rates of take, as the Proposed Combined Take would always be capped to 60 L/s. This is a very significant reduction in the instantaneous rate of abstraction of these applicants and reflects the commitment of these abstractors to mitigate effects on the Pigburn. Overall, the consented rate of abstraction in the Pigburn will reduce from 454.8 l/s to 332.6 (during moderate to higher flows) and to 262.6 l/s (during lower flows).

Higher rates of take primarily occur when flows are higher, and abstraction when flows are higher typically result in lesser environmental effects. Actual abstraction rates vary all season and reduce significantly from the consented rate when the stream flows decrease in summer. These takes will also be affected by the ORC's minimum flow at Waipiata once the permits have been issued which further reduces the impact of abstraction on the stream.

Other allocation limits are also proposed which act as a phasing out of existing allocation.

The first of these is the reduction in annual allocation. The total current annual allocation for all the applicants' permits is 13,920,600m³ (note that many of the annual volumes are extrapolated from other allocation limits on the permits, such as litres per hour). This application proposes to reduce the annual consented allocation to 5,765,930m³. This is a significant reduction when compared with what the applicants have legally been able to take under their existing permits.

The second is the limit placed on abstraction (and thus allocation) through residual flows and the minimum flow. The residual flows proposed will restrict access to water when flows lower, to protect aquatic values and natural character below the points of take. This limits allocation when it has its greatest impact on the waterway.

Based on this measures, this application is considered consistent with this objective.

Objective B3: To improve and maximise the efficient allocation and efficient use of water.

The majority of the area irrigated by Pigburn water uses some form of spray irrigation. The Mulholland and Smith properties are the only properties that currently only use overland flow methods of irrigation. However, a timeline is proposed as part of this consent application to convert the majority of the irrigated area on the Mulholland property to spray irrigation. Overland flow methods of irrigation on the Smith property are considered acceptable given the very low reliability of supply of water taken from the Shared take. Any conversion on this property will be dependent on finding a suitable dam site on the property.

Tearoa, Herlihys (on Grahams Block, irrigated with water from their Herlihy Gorge Take), Mulholland and Hamilton Runs (Weirs) are proposing to retain some portion of their property in overland flow irrigation. This recognises that flows in the Pigburn are very seasonal, and that on these properties, water can only be used for irrigation in an opportunistic manner (i.e. it is available irregularly), and so investment in spray irrigation is not warranted, and spray irrigation would not be effective, as water is not available consistently, as required for spray irrigation.

Taking this into account, the balance of spray and overland irrigation as proposed by this application is considered to be consistent with this objective.

Objective B5: To enable communities to provide for their economic well-being, including productive economic opportunities, in sustainably managing fresh water quantity, within limits.

In the hot, dry Maniototo climate, water for irrigation is essential to maintain a viable, robust farming business.

The residual flows proposed by this application will restrict access to water for the Herlihy Ford, Mulholland and Concept takes as outlined in Section 8.1 when it is most critical for irrigation, and may have an adverse financial impact on these farming businesses. Reduced access to water can be responded to in various ways by different business owners, including potentially reducing the irrigated areas or reducing the amount of feed that is grown, which in turn can lead to a reduction in stock numbers, or selling lower weight stock. All of this can result in a reduction of productivity. Alternatively, to mitigate this loss in productivity, some of the applicants may invest further in their irrigation systems, including by investing in more storage. These matters require careful balancing to ensure farm viability. Decisions will often depend on different property owner's appetite for debt and risk and/or their financial, business and personal situations.

Replacement of these permits as sought in this application, including on a long term basis, and within the limits proposed, will create sufficient certainty to enable the establishment of the Proposed Combined Take point, develop storage and make efficiency upgrades, as outlined in this application. This will enable these applicants to provide for their economic well-being and will support their community to do so also. The applicants are aware that the instream life and habitat must be protected and as such have developed and accept the proposed mitigation measures.

6.3 Otago Regional Council Regional Policy Statement

The Regional Policy Statement for Otago (RPS) provides an overview of the resource management issues for the Otago Region and the ways of achieving integrated management of its natural and physical resources. Otago's Regional Policy Statement is under review and has been made partially operative. The most relevant objectives and policies are contained in Chapter 6 (Water), of which some are now superseded by the Partially Operative RPS (PO-RPS, 14 January 2019). The objectives and policies particularly relevant to this proposal seek to:

Objective 6.4.1 To allocate Otago's water resources in a sustainable manner which meets the present and reasonably foreseeable needs of Otago's people and communities.

Objective 6.4.2 To maintain and enhance the quality of Otago's water resources in order to meet the present and reasonably foreseeable needs of Otago's communities.

Objective 6.4.3 To safeguard the life-supporting capacity of Otago's water resources through protecting the quantity and quality of those water resources.

Objective 6.4.4 To maintain and enhance the ecological, intrinsic, amenity and cultural values of Otago's water resources.

Policy 6.5.2 To allocate water in areas of Otago where there is or potentially will be insufficient water supplies through: (a) Considering the need to protect instream amenity and habitat values; and (b) Considering the needs of primary and secondary industry; and (c) Considering Kai Tahu cultural and spiritual values; and (d) Considering the extent to which adverse effects can be avoided, remedied or mitigated.²

Policy 6.5.3 To promote efficient consumptive water use through: (a) Promoting water use practices which minimise losses of water before, during and after application; and (b) Promoting water use practices which require less water; and (c) Promoting incentives for water users to use less water.

8.2.1 Proposed Regional Policy Statement

The proposed Regional Policy Statement (pRPS) was notified on 23 May 2015 and a decision was released on 1 October 2016. Significant weight can now be given to the pRPS as it is substantially through the statutory process. The pRPS was made partially operative on the 14th of January 2019 (PO-RPS) with the exception of all provisions and explanatory material in *Chapter 3: Otago has high quality natural resources and ecosystems*.

The relevant provisions of the pRPS (decisions version) include:

- *the values of Otago's natural resources are recognised, maintained and enhanced (Objective 3.1)*
- *managing freshwater to:*

² 4 Partially superseded by PORPS 14 January 2019 (Policy 2.1.2 Treaty Principles, Policy 2.2.1 kāi Tahu wellbeing)

- *Maintain or enhance ecosystem health in all Otago aquifers, and rivers, lakes, wetlands, and their margins*
- *Maintain good water quality, including in the coastal marine area, or enhance it where it has been degraded*
- *Maintain or enhance the natural functioning of rivers, lakes, and wetlands, their riparian margins, and aquifers*

The relevant provisions of the PO-RPS include:

- *achieve integrated resource management (Policy 1.1.1)*
- *provide for economic wellbeing (Policy 1.1.2)*
- *provide for social and cultural wellbeing and health and safety (Policy 1.1.3)*
- *taking the principles of Te Tiriti o Waitangi into account (Policy 2.1.2)*
- *managing the natural environment to support Kāi Tahu wellbeing (Policy 2.2.1)*
- *managing for freshwater values including*
 - *Maintain or enhance the natural functioning of rivers, lakes, and wetlands, their riparian margins, and aquifers*

Since the pRPS was made partially operative, the mediated version of Chapter 3 (changed by Environment Court order – 15 March 2019) has been incorporated into the latest version of the PO-RPS (but not yet made operative). In terms of productive use, economic and social well-being, the application seeks to be consistent with, or implement the following relevant provisions:

- *Recognise, maintain, and/or enhance the values (including intrinsic values) of Otago's ecosystems and natural resources (Objective 3.1)*
- *Identify and protect or enhance Otago's significant natural resources (Objective 3.2)*
- *Safeguard the life-supporting capacity of fresh water and manage fresh water (Policy 3.1.1)*
- *Manage allocation and use of water by recognising and providing for the social and economic benefits of sustainable water use, avoid over-allocation, phase out existing allocation, ensure efficient allocation including by encouraging the development or upgrade of infrastructure that increases efficiency (Policy 3.1.3).*
- *Encourage a collective approach to water management in the catchment, including rationing during low flows, and providing for water harvesting and storage (Policy 3.1.4).*

This application has been developed with the aim of being consistent with, or implementing the relevant RPS, pRPS and PO-RPS objectives and policies, as outlined in more detail in Section 6.4 and Section 8. As outlined in Section 8, several mitigation measures have been proposed including residual and minimum flows, fish screens and the establishment of the Proposed Combined Take point with a capped rate of abstraction for 3 of the existing takes will mean that this proposed activities are consistent with these objectives and policies. In addition, water is used efficiently within the majority of the irrigated area, and further development of efficient methods of irrigation are proposed where feasible.

6.4 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.

6.4.1 Status of Activity

6.4.1.1 Taking and Use of water

This application is for a replacement of both deemed permits and water permits for the taking and use of surface water.

- The shared take consents (Consents 2000.136, 2000.244 and 2000.245) replaced a water permit (3605) that was issued in 1992.
- The Bradfield's (En Hakkore) consent (2002.0101) replaced a water permit (3953) that was issued in 1982.
- The remaining takes are all deemed permits.

Accordingly, all of the abstractions in the Pig Burn come within Rule 12.1.4.4, and all of the abstractions have a **restricted discretionary activity status** and involve the taking and use of water as **primary allocation water** on the basis that:

- The Shared take and the Bradfield's take are subject to a resource consent that replaced a resource consent or authority that was granted before 28 February 1998 (Rule 12.1.4.4 (c)).
- The remaining takes, as deemed permits, were all granted before 28 February 1998 (Rule 12.1.4.4 (a)).

The discharge of water into Harpers Creek, and the subsequent re-take are as a result of the abstraction from the Pigburn by the Shared Take. Accordingly, this application seeks the replacement of the three permits associated with this (Consents 2000.136, 2000.244 and 2000.245) into one permit.

The matters to which Council has restricted its discretion are set out in Rule 12.1.4.8:

Rule 12.1.4.8 - Restricted discretionary activity considerations

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

- (i) The primary and supplementary allocation limits for the catchment; and*
- (ii) Whether the proposed take is primary or supplementary allocation for the catchment; and*
- (iii) The rate, volume, timing and frequency of water to be taken and used; and*
- (iv) The proposed methods of take, delivery and application of the water taken; and*
- (v) The source of water available to be taken; and*

- (vi) The location of the use of the water, when it will be taken out of a local catchment; and*
- (vii) Competing lawful local demand for that water; and*
- (viii) The minimum flow to be applied to the take of water, if consent is granted; and*
- (ix) Where the minimum flow is to be measured, if consent is granted; and*
- (x) The consent being exercised or suspended in accordance with any Council approved rationing regime; and*
- (xi) Any need for a residual flow at the point of take; and*
- (xii) Any need to prevent fish entering the intake and to locate new points of take to avoid adverse effects on fish spawning sites; and*
- (xiii) Any effect on any Regionally Significant Wetland or on any regionally significant wetland value; and*
- (xiv) Any financial contribution for regionally significant wetland values or Regionally Significant Wetlands that are adversely affected; and*
- (xv) Any actual or potential effects on any groundwater body; and*
- (xvi) Any adverse effect on any lawful take of water, if consent is granted, including potential bore interference; and*
- (xvii) Whether the taking of water under a water permit should be restricted to allow the exercise of another water permit; and*
- (xviii) Any arrangement for cooperation with other takers or users; and*
- (xix) Any water storage facility available for the water taken, and its capacity; and*
- (xx) The duration of the resource consent; and*
- (xxi) The information, monitoring and metering requirements; and*
- (xxii) Any bond; and*
- (xxiii) The review of conditions of the resource consent; and*
- (xxiv) For resource consents in the Waitaki catchment the matters in (i) to (xxiii) above, as well as matters in Policies 6.6A.1 to 6.6A.6.*

These matters, where relevant, are addressed throughout this document.

6.4.1.2 Discharge of Water

The Shared Take abstracts water from the Pigburn and discharges it into Harpers Creek, and uses Harpers Creek to convey water to the subsequent retake location.

The discharge of water to water is a **discretionary activity** under Rule 12.C.3.2 of the RPW.

6.4.1.3 Retaking of water

Under Rule 12.1.4.1 the taking and use of surface water from any lake or river which has already been delivered to that lake or river for the purpose of this subsequent taking is a **restricted discretionary activity** with discretion restricted to the following matters:

- (a) "The amount of water which can be taken, having regard to the amount delivered to the lake or river and any losses that may have occurred between the point of augmentation and the take; and*

- (b) Any need to prevent fish entering the intake; and
- (c) The duration of the resource consent; and
- (d) The information and monitoring requirements; and
- (e) Any bond; and
- (f) The review of conditions of the resource consent.”

These matters are addressed throughout this document where relevant.

6.4.2 Transfer of Location of Point of Take

This application proposes to transfer the Herlihy Ford Take (during low flows) and the Mulholland Take to the Proposed Combined Take.

Section 136(2)(b) of the RMA allows the transfer of a water permit to another site in certain circumstances. As these permits relate to an activity for which consent is required under Part 3 of the RMA, section 87B(1)(b) 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 (please refer to Section 6.4.7). The effects of shifting the location of these Takes are a key part of the mitigation approach taken in the application. This is addressed in Section 8.

6.4.3 Exemption to measure away from point of take

A number of the takes are monitored more than 100 metres from the point of take and all of these have an exemption (a WEX) to do so, as shown in Table 16 below. A WEX for the Proposed Combined Take is not anticipated to be necessary at the time monitoring is established for that point of take.

Table 16. Takes subject to a WEX

Take	Exemption required for not being at point of take	WEX secured?
Shared permit	Yes	Yes WEX0238
En Hakkore Ltd [Bradfield]	Yes	Yes WEX0232
Herlihy Gorge	Yes	Yes WEX0063
Hamilton Runs Limited [Weirs]	No – within 100m	N/A
Herlihy Ford	Yes	Yes WEX0062
Concept South	Yes measured before entering MESIS race.	Yes WEX0168
Mulholland	Yes	Yes WEX0049
Concept North	No, within 100 m of intake	N/A

6.4.4 Bundling of 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.

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

The most restrictive activity status applying to the activities subject to this application is a discretionary activity, as it applies to the discharge into Harpers Creek, and the transfer of location for the Herlihy Ford (during lower flows) and Mulholland Takes. The applicants have accepted a bundling approach, on the basis that they are applying as an informal group, with a collective focus on management of effects on the Pigburn.

On this basis this application has a **discretionary activity status**.

6.4.5 Section 417 Certificates

Table 17 outlines whether the permits subject to this application may also require a section 417 certificate. At the time of writing, the permit holders are in the process of applying for Section 417 Certificates and ensuring these are registered against the relevant titles.

Table 17. Permits which may require a s417 Certificate

Take	Consent	Take and race/pipe on someone elses property?	S417 Certificate issued by ORC?
Shared take - Pigburn	2000.136	Yes	No – application underway
Shared Take - Harpers	2000.244	Yes	No – application underway
Shared Discharge	2000.245	Yes	No – application underway
Bradfields (En Hakkore)	2002.0101	Yes	No – application underway
Herlihy Gorge Take	96394	Yes	No – application underway
Weirs (Hamilton Run)	97210	Yes	No – application underway
Herlihy Ford Take	96230.V1	Yes	No – application underway
Concept South	97128	Yes	No – application underway
Mulholland	2000.498	Yes	No – application underway
Concept North	96254	No	Yes, but no longer required (MC030)

6.4.6 Permitted activities

Under Schedule 4(3) of the RMA, this application is required to provide a description of permitted activities that form part of the proposal to which the application relates.

6.4.6.1 Intake structures

Under Rule 13.1.1.1 the use of a structure in a waterway is permitted if it meets certain conditions, including that the structure was lawfully established.

Where structures were established to exercise a mining privilege relating to water, they were lawfully established as follows:

1. The water race licence associated with mining privilege authorised the intake (Sections 2 and 4 of the Water and Soil Conservation Amendment Act 1971, which adopted the provisions of preceding mining legislation).
2. Such activities continued to be authorised under the transitional provisions of the Resource Management Act, in particular Section 418(3A), until a Regional Plan otherwise provided.

The intakes associated with the Weirs, Herlihy, Mulholland, Concept takes are all authorised by a deemed permit which replaced a water race licence and so were lawfully established.

In general terms, from the date the RPW became operative the continued use, repair, alteration, maintenance of these intakes structures is permitted (pursuant to Rules 13.1.1.1, 13.3.1.1 and 13.3.1.2) as long as:

- the structure is replaced or reconstructed in the same location as the original structure
- there is no permanent change to the scale, nature or functions of the structure

In addition, the disturbance of the bed of any river, and any resulting discharge or deposition of bed material associated with the maintenance or reinstatement of a water intake, in order to enable the exercise of a lawful take of water, is a permitted activity under Rule 13.5.1.1. The conditions of this rule will be complied with by the applicants.

The Shared Take and the Bradfield's take comply with permitted activity Rule 13.2.1.4, as they do not exceed 2m² in area, have never been known to cause erosion, flooding, and have been maintained in good repair. The establishment of this intake site would have been known to the ORC at the date at which the water permits were granted.

As with the deemed permits, permitted activity Rules 13.1.1.1, 13.3.1.1, 13.3.1.2 and 13.5.1.1 also apply to these intake structures, and are/will be complied with, including that there has been no change to the scale or function of these intake structures, and they have remained in the same location.

The Proposed Combined Take is proposed to be located at the site of the existing intake for the Concept South Take. This intake has not yet been fully designed, as the applicants would like to secure their permits to take water first. If any changes to this intake area required, it will be designed to comply with the permitted activity rules relating to intake structures (Rule 13.2.1.4).

6.4.6.2 Water quality

The RPW contains several permitted activity rules relating to water quality. Rule 12.C.1.1 permits the discharge of water or any contaminant to water, or onto or into land in circumstances which may result in a contaminant entering water, providing certain conditions are met. These conditions are primarily focused on indicators of an adverse effect on water quality such as odours, or a change in colour or clarity.

Discharges from the applicant's farms are expected to comply also, as compliance is anticipated with good farm management practices such as keeping stock out of waterways, ensuring irrigation of effluent does not result in ponding or surface run-off and ensuring sediment does not enter waterways. However as on-farm management and systems can change it is difficult to provide a definitive assessment that all discharges from all farms within the catchment will comply with this rule at all times within the term of any consent for the consents being sought by this application. In the event that some farms may not comply, the farm owners will need to change on farm practices or obtain a resource consent.

Under the current RPW, specific contaminant limits were to come into effect in waterways under permitted activity Rule 12.C.1.1A on 1 April 2020. However, at the time of writing the ORC had extended this deadline from 1 April 2020 to 2023.

Nitrogen leaching limits were also to come into effect under permitted activity Rule 12.C.1.3 from 1 April 2020. Under this rule the discharge of nitrogen onto or into land in circumstances which may result in nitrogen entering groundwater is permitted in the applicant's command area providing the nitrogen leaching rate does not exceed 30 kgN/ha/year for the total area of land managed by a landholder. The deadline for this coming into effect is also proposed to be extended to 2023.

In addition, a second plan change is proposed to be notified by March 2020, which will amend the water quality rules currently in effect.

Accordingly, detailed consideration of these rules is not carried out here, as they not currently in effect, and are likely to be changed.

6.4.7 Relevant Policies

Key policies of relevance to this application include:

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 8, and are shown to maintain or enhance these values.

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

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.*

Abstraction of water from the Pigburn catchment has impacted on the flow characteristics and ecology of the Pigburn. 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 – in this case associated developments include historical races, and the development and use of surrounding land for pastoral farming over many decades. Notwithstanding this, the topography, natural flow characteristics and ecology of the Pigburn catchment have been given regard when developing this application. As demonstrated in Section 8 of this application, the proposal will result in improvements to the ecology of the Pigburn, and more natural flow characteristics than has been the case under the existing abstraction regime.

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

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 Pigburn are influenced by the history of abstraction and the resultant productive land uses which surround it. The Pigburn itself is not highly valued for amenity use and recreation but flows from the Pigburn do contribute to amenity values in the Taieri River. In Section 8 it is concluded that these values will be enhanced by the more natural flow characteristics and compliance with the minimum flow at Waipiata that will result from this application.

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

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 assessment of effects in Section 8 indicate that this application proposes a reduction in the effects on the matters listed in Policy 5.4.2(a), and where effects cannot be avoided, they are proposed to be mitigated. This includes avoiding or reducing the extent and duration of low flows caused by abstraction, and mitigating the associated adverse effects on natural and cultural values, and the natural character and amenity values of the Pigburn and the Taieri catchment.

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

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

The proposed mitigation measures including the minimum flow and residual flows proposed to be applied to the takes in this application, and the establishment of the Proposed Combined Take will support the retention of flows in the Pigburn and Taieri River to support life-supporting capacity and natural character.

Objective 6.3.3 *To minimise conflict among those taking water*

The applicants comprise all the water users on the Pigburn. They have worked together as a catchment and have developed a proposal with one of the aims being to minimise conflict between them. This collective approach represents a significant change in the historic system of priorities within the Pigburn catchment.

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

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

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

The ORC applies the Aqualinc guidelines to determine whether the quantity of water granted is no more than that required for irrigation of pasture (as the key purpose of use for these applicants). The Aqualinc guidelines take into account local climate, soil and that irrigation is occurring on pasture, as well as water availability.

Table 14 in Section 4 shows that all of the applicants are within what is considered a reasonable irrigation demand (from all combined sources) as set out in the Aqualinc guidelines. This indicates that the water use by the applicants is considered reasonable and efficient.

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.

The applicants have worked together to develop the proposal contained in this application, including the residual flows and the establishment of the Proposed Combined Take. This highlights their willingness to work together and their commitment to developing a proposal that is as equitable as possible for all of them, based on historical access to water.

A summary of how the water will be used and managed is provided in the table below:

Table 18. How the water will be used and managed in the Pigburn

Purpose of water use	Domestic use, irrigation, stock drinking water, and dairy shed use
Name of associated water allocation committee or water management group	Not applicable – no formal water management group within the Pigburn. However, the Pigburn water users would be part of any Upper Taieri Water Management Group.
Description of how the water allocation committee or water management group operates	Informally at this stage, consensus approach within the Pigburn. Sharing of data, information.
Description of how the water rationing regime applies to the proposed takes	Water rationing will primarily occur through residual flows and through co-operation of permit holders taking water from Proposed Combined Take.
Description of any 're-take' water that applicants or others will use from the takes	Description of re-take and use of this water included in relation to Shared Take in Section 2.2.1

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.*

All of the applicants have applied for no more water than they have a record of taking from the Pigburn in the past.

At the time of writing all of the takes except for the Shared Take and Bradfield's Take have 5 or more years of data.

The Bradfield take is a small, consistent take – the infrastructure for this take has been in place for many years, including both the intake and pipe and the domestic infrastructure which relies on this take. This is evidence that this take has been in use, up to the rate applied for, for much longer than 5 years.

The infrastructure associated with the Shared Take and Weirs take have also been in place for many years, including both the intake, the races and the irrigation infrastructure. This is evident in the contour flood and border dyke infrastructure which predates the spray infrastructure currently in place, and the history of farming these properties. This is evidence that these takes have been in use, up to the rate and volume applied for, for much longer than 5 years.

Evidence of this is contained in previous recommending reports relating to these takes held by the ORC, photos of the properties including irrigation infrastructure and maps showing irrigation areas.

Policy 6.4.3 For catchments identified in Schedule 2A, except as provided for by Policy 6.4.8, minimum flows are set for the purpose of restricting primary allocation takes of water

The relevant minimum flow in Schedule 2A is located at the "Taieri River at Waipiata" ORC monitoring site and is 1,000 litres per second.

Rule 12.1.4.4 (iii), (iv) and (v) direct that the relevant minimum flow shall affect the exercise of every resource consent or other authority, but that the minimum flow **shall not** apply until the ORC carries out a review of all such consent conditions (under s128 to 132 of the RMA). This approach is supported by Policy 6.4.5.

On this basis it is requested that the minimum flow should not be applied at the time this consent is replaced, but after a collective review of all relevant consents in the Taieri catchment. A consent condition indicating that the minimum flow will be imposed on this basis is proposed.

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.

An assessment of the need to maintain a residual flow at the points of take subject to this application is undertaken in Appendix C and is summarised in Section 8. Taking into consideration hydrological characteristics, ecological values and natural character, residual flows have been proposed where appropriate.

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.*

This application proposes to transfer the location of the Herlihy Ford Take (during moderate to higher flows) and the Mulholland Take (at all times) to the Proposed Combined Take location (at the existing location of the Concept South take). These transfers meet the requirements of this policy:

- a) The proposed new take location is within the same catchment as the original permits.
- 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 an overall reduction in the combined total maximum rates of take abstracted at the existing locations for these consents.
- c) The amount of water taken is no more than that required for the purpose of use, as set out in Section 4.
- d) The transfer will result in positive effects on natural values as set out in Appendix C. There will also be no more than minor adverse effects on any other take (as discussed in Section 8.7), right to store water or human use value as a result of the transfer itself.

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:

- Any potential or actual adverse effects resulting from the proposal will be appropriately mitigated, where relevant, by the inclusion of a minimum flow condition, residual flow conditions, fish screen conditions, the establishment of the Proposed Combined Take and a capped rate of abstraction on the Proposed Combined Take.

- The use or proposed development of efficient spray application methods as the primary method of irrigation within the irrigated areas, along with fencing of riparian areas or wetland areas with Concept Farms, means that any risk of contaminants discharging to waterways is greatly reduced, making it unlikely that the permitted activity rules and Schedule 16 discharge thresholds would be breached.
- The applicants have worked collectively as an informal group and have developed this proposal to manage and reduce abstraction during low flows and to enable the shared use and management of water, through residual flows, the minimum flow and the Proposed Combined Take. The applicants would accept a condition of consent requiring each permit holder to operate in accordance with any Council approved rationing regime or Water Management Group that may developed in the future for the Upper Taieri catchment.
- The application gains support from the relevant policies of the RWP which together aim 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.
- The term sought provides sufficient surety and confidence to enable each permit holder to make investment decisions, attain any required finance from lending agencies to realise any upgrades to infrastructure, and general confidence for farm management in the longer term. Short term permits do not provide the confidence in water access security looked for by funding bodies and can create a situation where permit holders are unable to obtain the necessary finance to make continual improvements to their farming systems. Specifically:
 - A long term consent is necessary to justify and support the infrastructure changes required to establish the Proposed Combined Take point, and the investment in these changes.
 - A long term consent is also necessary to enable the proposed farm developments including dams and installation of pivots, as discussed in Section 2, to improve reliability of supply and efficiency of use, which in turn enables a transition to efficient spray methods of irrigation.
- The majority of the water permits in the Taieri River Catchment have expiry dates beyond 2031. Approximately 78% of the water in the Taieri River Catchment (l/sec) has already been re-issued on permits that expire between 2031 and 2054 as shown in the Table below.

Table 19. The percentage of permits in the Taieri Catchment within each expiry date range.

Expiry date	Sum of the l/s allocated	Percentage of the catchment
Expire by 2024	5951.06	20.8%
Expire between 2024 and 2027	117	0.41%
Expire between 2031 and 2054	22504.95	78.8%
Total	28,573.01	100%

Please note: The Trust Power permits at Mahinerangi, supplementary and non-consumptive takes have not been included in the data shown in this table. Data source: ORC supplied spreadsheet.

Taking these aspects into account, and to provide sufficient surety and confidence for farm management, development of efficient irrigation (where proposed) and future investment decisions, the applicants request a term of 35 years for their replacement consents.

7. Consideration of Alternatives

Primary allocation within the Taieri Catchment is considered to be fully-allocated. These water takes are an existing take within the primary allocation limit for this catchment.

There are no other reliable sources of water in the vicinity of these properties that have primary allocation water available. On this basis no realistic alternatives are available for a sufficient supply of reliable water for the purpose of irrigating these properties.

An application for supplementary water may be necessary for the applicants most affected by this proposal to address the impact of residual and minimum flow conditions on surety of supply. However, a further reduction in primary allocation (beyond that imposed via residual and minimum flow conditions) is not considered to be a viable alternative to the existing primary allocation held by these applicants. As supplementary water cannot be accessed at the time water is most needed during the height of the irrigation season (as flows are typically lower), it requires further investment in storage dams.

A number of the applicants have already invested in storage dams to enable a transition to spray irrigation utilising their existing primary allocation water. An increased reliance on supplementary water would require considerable further investment to make up for the loss in the most reliable water if primary allocation was reduced. This is not considered to be a viable alternative due to the costs associated with this, difficulties in finding suitable sites for large dams, and the loss of surety of supply.

8. Assessment of Environmental Effects

8.1 Effects on Hydrology

8.1.1 Pigburn

The assessment by Matt Hickey in Appendix C acknowledges that total abstraction from the Pigburn represents significant hydrological alteration in the natural flow regime.³ However, the effects of each take on hydrological characteristics varies depending on the location of the take and the allocation.

The Shared Take is located in a perennially flowing reach in the headwaters of the Pigburn, and the permit holders have observed that there is always surface flow both at and below this point of take. The Bradfield Take is small in nature and is located in a perennially flowing reach in the gorge, and so has limited effects on hydrological characteristics.

For the lower reaches of the Pigburn (from the Herlihy Gorge take and downstream) the assessment in Appendix C concludes that there are two significant natural losing reaches: the upper losing reach, which is dry naturally on an annual basis; and the lower losing reach, which potentially dries on an annual basis. Observations indicate that losses in the lower losing reach varies significantly and that surrounding groundwater levels likely influence loss rates greatly.

Mr Hickey's assessment (Appendix C) also concludes that there are two gaining reaches that are perennial naturally. Under the existing regime of abstraction, the upper gaining reach becomes fragmented and intermittent.

The assessment in Appendix C notes that both the Herlihy Gorge Take and the Weir Take are naturally curtailed during times of low flow due to the losing reach going dry. It also notes that currently the gaining reach in the Pig Burn between the Weir Take and the Patearoa Waipiata Rd Bridge is changed from perennial to intermittent due to abstraction by the three takes within it.

To reduce the degree of hydrological alteration, the applicants are proposing residual flows for all takes within perennial reaches, with the exception of the Bradfield Take as it is very small (<7 l/s) compared to the size of the Pig Burn at the take point (>31 l/s).

In addition, the applicants propose to amalgamate the Mulholland and Concept South Takes (at the existing take location for the Concept South Take) during times of high to moderate flows. At times of low flows abstraction from the Herlihy Ford take would be shifted to this Proposed Combined Take point also. This would ensure higher flows remain in the upper gaining reach to prevent dewatering of this reach. Water from the Proposed Combined Take will be shared between the permit holders abstracting at that point. The rate of take from this Proposed Combined Take point would be capped at 60 l/s at all times.

³ Executive summary of Appendix C

A residual flow is also proposed for the Proposed Combined Take (10 l/s). This would mean that disconnection in the lower losing reach would both be reduced in extent and duration compared to what has occurred historically. Once flows emerge in the lower gaining reach, they will be maintained to the confluence via a residual flow on the Concept North Take.

It is expected that the proposal would maintaining a flow pattern comparable to what would occur naturally with no abstraction.

It is proposed that while flows are high the Herlihy Ford Take should operate as normal (but with a capped rate of abstraction of 70 l/s) while leaving a residual flow of 70 l/s past their intake.

The most downstream take on the Pig Burn, Concept North will remain in place with a residual flow of 10 l/s.

The assessment in Appendix C concludes that this proposal would result in a significant improvement on the existing flow regime, and that it is anticipated to result in a flow regime that will mimic the natural pattern of gains and losses along the Pig Burn. This proposal prevents any dewatering of the perennial reaches of the Pig Burn maintaining a continuous flow along the reaches that would not naturally dry.

In addition to residual flows, the rates of abstraction and annual volumes proposed have been reduced, as shown in Table 14 in Section 4 of this document. Decreases in allocation, whether through instantaneous rates or annual volumes, further reduces the actual or potential degree of hydrological alteration caused by abstraction, and improves flows within the Pigburn when compared to the existing regime. This is particularly evident with the Proposed Combined Take, which the applicants propose to cap at 60 l/s at all times. This is a reduction from 111.2 l/s (the combined rate of the Mulholland and Concept South takes based on historic maximum rates of take) and 203.2l/s (the combined rate of the Mulholland, Concept South and Herlihy Ford takes based on historic maximum rates of take). This is a very significant reduction in the instantaneous rate of abstraction and reflects the commitment of these abstractors to mitigate effects on the Pigburn.

Summary of residual flows proposed (from Appendix C):

- Shared Take and Re-Take - No residual flow is proposed as it naturally dries at the intake each summer, and Harpers Creek would not flow naturally during the irrigation season.
- Bradfield Take - No residual flow is proposed as the take is small (<7 l/s) relatively to the size of the Pig Burn with the lowest daily average flow recorded downstream of the take of 31 l/s.
- Herlihy Gorge Take- No residual flow is recommended as natural losses in this reach restrict the taking during low flows naturally.
- Weir Take - No residual flow is recommended as natural losses in this reach restrict the taking during low flows naturally.
- Herlihy Ford Take – A capped rate of take of 70 l/s and a residual flow of 70 l/s is proposed during higher flows. It is expected that this residual flow will ensure the gaining reach from the Hamilton Runs Ford to the Proposed Combined Take will flow continuously.

- Higher Flows Proposed Combined Take (Concept South and Mulholland, located at Concept South existing take point) – A residual flow of 10 l/s is proposed. It is expected that this residual flow in combination with the maximum rate of take being capped at 60 l/s will reduce the extent and duration of drying in the lower losing reach. By leaving a residual flow it is also expected that the rate of drying in the lower losing reach will be reduced. Abstraction of 60l/s would be shared equally between Concept Farms and the Mulhollands (i.e. up to 30 l/s each).
- Low Flows Proposed Combined Take (Herlihy, Concept South and Mulholland, located at Concept South existing take point) – A residual flow of 10 l/s is proposed. It is expected that this residual flow in combination with the maximum rate of take being capped at 60 l/s will reduce the extent and duration of drying in the lower losing reach. It is also expected that the rate of drying in the lower losing reach will be reduced. The abstraction of up to 60l/s would be shared on a 40:30:30% basis between Herlihy's: Concept Farms: Mulhollands (i.e. up to 24:18:18 l/s each).
- Concept North Take - A residual flow of 10 l/s is recommended. It is expected that this residual flow will ensure the lower gaining reach from O'Neil Road to the Taieri confluence will flow continuously.

The Proposed Combined Take negates the need for low flow sharing (and thus also the need for a Water Management Group). This is because it combines the 3 takes that would have been most suited for low flow sharing, due to the location of these takes in relation to losing reaches of the lower Pigburn. Combining these takes effectively requires sharing to occur between these 3 abstractors during times of low flows. Sharing will occur on an equal basis between these abstractors. Residual flows and compliance with the minimum flow at Waipiata effectively limits abstraction at times of low flows, as irrigators reduce their rates of takes as flows drop towards these limits.

8.1.2 Harpers Creek

The assessment in Appendix C notes that Harpers Creek is a naturally ephemeral creek that drains the northern end of the Rock and Pillars. Without the introduction of Pig Burn water into Harpers Creek it would be likely to only flow during wetter winter months or following rainfall events. The discharge of water taken by the Shared Take into Harpers Creek is small and is not anticipated to create erosion, flooding, instability, or damage. In addition, the discharge is within the same catchment (the Taieri catchment), and does not alter any Regionally Significant Wetland.

The addition of water to Harpers Creek is unlikely to create adverse effects, even though it does represent hydrological alteration as opposed to natural flows.

The augmentation of this Creek may be viewed as providing some positive effects on hydrological characteristics and associated instream values in Harpers Creek, as this augmentation provides more consistent flows, for a longer period, than would occur naturally.

On the basis that Harpers Creek would not flow naturally through the irrigation season, no residual flow condition is considered necessary for the re-take from Harper Creek.

8.2 Effects on Ecological Values

Schedule 1A of the RPW lists natural values present in the Pigburn as a significant fish spawning and juvenile rearing area. The only species referred to are trout.

The NIWA Freshwater Fish Database lists the presence of trout and longfin eels in entries for the Pigburn related to electric fishing in the 1980's. More recent entries in the database date from 2013 and 2016 show the consistent presence of brown trout but only one longfin eel was recorded as being present in an entry from 2016.

Freshwater shrimp, freshwater mussels and freshwater crayfish (koura) have an abundance notation of "n" in the NIWA Freshwater Fish Database for the Pigburn. The meaning of this is not clear given the coding for abundance is specified as "a = abundant, c = common, o = occasional, r = rare" in the New Zealand Freshwater Fish Database User Guide.⁴ The "n" notation is thought to refer to a "nil" occurrence of these species.

Figure 7 in Appendix C shows the distribution of fish species in the Pigburn.

The proposed residual flows outlined in the Section 8.1.1 have been proposed to mitigate (where relevant) potential effects on ecological values present at each point of take (refer also to Appendix C):

- Herlihy at the Ford Take – The capped rate of abstraction at 70 l/s and the proposed residual flow of 70l/s during higher flows is expected to result in continuous surface flows below this point of take providing improved habitat for juvenile brown trout and longfin eel compared to what occurs under the status quo.
- Higher Flows Proposed Combined Take (Concept South and Mulholland) – A residual flow of 10l/s and a capped rate of abstraction of 60l/s. This is expected to improve habitat for juvenile brown trout and longfin eel compared to what occurs under the status quo. It is also expected to reduce the rate of drying in the lower losing reach providing opportunity for fish to move into perennial reaches.
- Low Flows Proposed Combined Take (Herlihy, Concept South and Mulholland) – A residual flow of 10 l/s is proposed, along with a capped combined total rate of abstraction of 60l/s. This is expected to provide opportunity for fish to move into the perennial reaches.
- Concept North Take - A residual flow of 10l/s is recommended. It is expected that this residual flow will ensure the lower gaining reach from O'Neill Road to the Taieri confluence will flow continuously providing improved habitat for juvenile brown trout and longfin eel compared to what occurs under the status quo.

As noted in Section 8.1.1 above, in addition to residual flows, the rates of abstraction and annual volumes proposed have been reduced for several of the applicants, as shown in Table 14 in Section 4. Decreases in allocation, whether through instantaneous rates or annual volumes, further reduces

⁴ NIWA Client Report: HAM2005-033, September 2005, Updated July 2008

the actual or potential effects caused by abstraction and improves flows within the Pigburn when compared to the existing regime.

All intakes from the Pigburn are proposed to be screened, except for the shared take, which is located quite far upstream of the presence of any fish species in the Pigburn. A fish screen would be difficult to check and maintain, given the remote location and high altitude of this intake. Fish screens will further mitigate the effects of these abstractions, as it will prevent entrainment of fish in any races and dams.

All takes from the Pigburn would also be subject to the minimum flow at Waipiata. Currently nine of these takes have a minimum flow condition. The inclusion of the minimum flow would ensure that the cumulative effects of these takes, in combination with all other takes above Waipiata, would be managed to ensure that effects on the ecological values of the Taieri River would be appropriately mitigated.

8.3 Cultural Values

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 rōpū include:

- Moturata Taieri Whānau
- Waikoau Ngāi Tahu Rūnanga

There are several planning documents or sections of planning documents that highlight values of importance to Kai Tahu and these Papatipu Rūnaka. These are discussed below.

8.3.1 Kāi Tahu Ki Otago Natural Resource Management Plan (2005).

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

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.

Aukaha's NRMP 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.

The NRMP includes a number of issues and associated objectives and policies for the Taieri catchments. It notes that the Taieri Catchments remain of great significance to Kāi Tahu ki Otago.

Issue 9.2.2 identifies the following issues of relevance to this application:

- The natural seasonal flow regimes throughout the Taieri Catchments have been altered due to the demands of extractive uses and/or power generation.
- Prolonged periods of minimum flows in the tributaries and main stem of the Taieri River do not provide a regular flushing flow and therefore add to the ill health of the catchment.
- Water extractions from the tributaries of the Taieri River can result in dewatering and affect flows in the main stem.

In response to these issues, Policy 9.2.3.7 requires that cumulative effects and Ki Uta Ki Tai values are addressed in water allocation in the Taieri Catchment.

Issue 9.4.2 states that low flows and/or dewatering of significant reaches of waterways is affecting mahika kai habitat. In response Policy 9.4.3 encourages the development of the Taieri River as a "mountains to the sea" corridor, including to protect native fish migration and to restore mahika kai within the Taieri Catchments.

8.3.2 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.

8.3.3 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 as relevant to all streams on the west facing slopes of the Rock and Pillar Range (which includes the Pigburn):

- *Waahi taoka* – treasured resource;
- *Mahikia kai* – places where food is procured or produced.

8.3.4 Effects on Cultural Values

The values, uses and beliefs identified in the documents described above have been considered in developing the proposal in this application.

The Pigburn is characterised by naturally higher flows during the spring, and very low natural flows during the summer, with losing and gaining reaches in the lower section of the Pigburn. Abstraction in the past has impacted on natural flow characteristics and the ecology of the Pigburn. This is likely to have had a corresponding impact on the cultural values associated with the Pigburn, as outlined above.

This application proposes conditions of consent requiring adherence to residual flows, the minimum flow at Waipiata, and fish screens, as well as the Proposed Combined Take for the Mulholland, Concept South and Herlihy take. These are all proposed as mitigation measures to reduce the impact of abstraction on the Pigburn and the Taieri River. These mitigation measures have attempted to acknowledge, support and improve the Mauri of the Pigburn and its status as a treasured resource and are expected to:

- result in a significant improvement on the existing flow regime;
- mimic the natural pattern of gains and losses along the Pig Burn;
- prevent any dewatering of the perennial reaches of the Pig Burn, maintaining a continuous flow along the reaches that would not naturally dry;
- provide improved habitat for longfin eel compared to what occurs under the status quo;
- reduce the rate of drying in the lower losing reach providing opportunity for fish to move into perennial reaches;
- prevent eels becoming entrained in races and dams (as a result of fish screening); and
- support and enhance Kai Tahu values associated with the mainstem of the Taieri River (via adherence to the minimum flow).

These measures are anticipated to effectively mitigate the effects of abstractions on Kai Tahu values associated with the Pigburn and the Taieri River.

8.4 Effects on Recreational Values

The Pig Burn is not valued for recreational use in itself. Local families utilise the Sowburn swimming hole for swimming in summer, and no recreational fishing use of the Pigburn is known to occur. No picnicking or camping is known to occur beside the Pigburn.

The Pigburn may act as a spawning stream for trout and would therefore support recreational trout fishing in the Taieri River. It is worth noting that recreational fisheries values are present in the Taieri River notwithstanding the abstraction from these points of take, and the long history of abstraction in the Taieri catchment. The inclusion of the proposed residual and minimum flows, the establishment of the Combined point of take, along with fish screening is likely to enhance recreation opportunities in the long term associated with fishing in the Taieri catchment more generally, for the reasons outlined in Section 8.1 and 8.2.

On this basis, the continuation of this existing abstraction is likely to have very minimal adverse effects on recreational values.

8.5 Effects on Amenity and Natural Character

The upper reaches of the Pigburn from its headwaters through to the bottom of the gorge have a high degree of natural character as the landuse surrounding these reaches are more undeveloped in nature, as is the Pigburn itself. The Shared Take, the Bradfields Take and the Herlihy's Gorge Take are located in these reaches. The intake structures associated with the Shared Take and the Bradfield Take are small and unobtrusive in nature, as can be seen from the photos in Appendix B and are not in a readily accessible area. Water always flows past these intakes. These takes are considered to have a minimal impact on amenity and natural character.

The Herlihy's Gorge Take uses rocks found in the creek bed to take water into their race (refer to Appendix B). The rocks and gravels fit within the landscape and are not considered to significantly detract from the natural character or amenity of the area.

All of the remaining takes, are located in the lower reaches of the Pigburn. These takes are situated within a more developed pastoral landscape, with dairy farms and sheep and beef farms adjacent to the Pigburn, and roads, fords and bridges cross the Pigburn in places. This is consistent with the lower reaches of other streams draining the western slopes of the Rock and Pillar Ranges. Structures related to irrigation and farming are common in this landscape, including races, measuring devices and intake structures.

The intake structures located in the lower reaches of the Pigburn are relatively unobtrusive within this landscape context, (refer to Appendix B) and often use gravels and rocks from the creek bed. The scale and nature of the applicants' intake structures and abstraction of water are consistent with this landscape.

The Proposed Combined Take would also be in keeping with the surrounding land use and context. It will utilise a piped intake, and so would not involve any significant alteration to the bed of the Pigburn.

The residual flows proposed for these takes, and the establishment of the Proposed Combined Take will ensure that sufficient flow remains in the Pigburn to maintain and enhance natural character as these changes are expected to:

- result in a significant improvement on the existing flow regime;
- mimic the natural pattern of gains and losses along the Pig Burn; and
- prevent any dewatering of the perennial reaches of the Pig Burn maintaining a continuous flow along the reaches that would not naturally dry

On this basis the continued abstraction from the intake structures, with the proposed mitigation measures are considered to have very minimal effects on natural character and amenity.

8.6 Economic effects

For the sheep and beef farmers this water is essential for growing feed. Without it feed shortages would occur which would require destocking. Winter feed crops and hay paddocks would not grow and staff would need to be laid off due to reduced income.

Dairy farming would simply not be possible in this region without a reliable, sufficient supply of water. Water from the Pig Burn is important to these operations to provide enough water, when combined with water from other sources.

Contractors and casual staff are employed by all of the Pig Burn water users to carry out a wide range of activities including dam design and construction, surveying, excavation, silage, fencing, spraying, as well as irrigation design, installation and servicing.

The Weirs are currently considering an agri-tourism operation, providing a tour of the farm operation, 4 wheel drive and a gold mining history and demonstration tour. Their consideration of this option highlights the challenges of keeping sheep and beef farming operations economically successful.

Table 19 below shows the families and employees directly supported by these businesses.

Table 20. Families and employees directly supported by the applicants' businesses

Take	Consent Holder	Families and staff supported by these farms/properties
Shared Take	Pigburn Gorge / Tearoa / Smith at 1/3 shares each	4 families
Bradfields	En Hakkore Ltd	2 families
Herlihy Gorge and Ford takes	Greenbank Pastoral Ltd and Hamiltons Dairy Ltd	2 families (3 generations) Up to 15 FTE's (peaks in summer)
Weirs	Hamilton Runs Limited	2 families (3 generations) 1 FTE 4 part time workers
Concept South and North	Concept Farms Ltd	21 FTEs with additional 3-4 relief workers throughout the season.

		<p>This includes:</p> <ul style="list-style-type: none"> • 5 families with children on farm (10 children attending local schools) • 7 individuals with families overseas
Mulholland	Mulholland	1 family

The Proposed Combined Take point for the Mulholland, Concept and Herlihy properties represents a significant commitment to enhancing the ecological and cultural values associated with the Pigburn. This proposal will require investment in the design and establishment of a new intake and race system to connect to existing farm infrastructure. This investment also reflects how critical water is to support these businesses.

As discussed in Section 6.2 in relation to Objective B5 of the NPSFM, a sufficiently, reliable supply of water is vital for ensuring the continued economic viability of these properties.

For Concept Farms, the combination of water from the Pigburn and MESIC results in approximately 70% reliability during the season. Industry standards for efficient spray irrigation (such as centre pivots) require 95% reliability of supply. The fact that Concept Farms has been able to operate and develop with as little as 70% reliability highlights how crucial this water is for their economic survival but also how effectively they are using the water they do have available to them. Nevertheless, this is not an ideal scenario and Concept Farms are working to increase the reliability of supply by increasing the amount of storage on farm.

As discussed in Section 6.2, the residual and minimum flows proposed by this application will restrict access to water for the applicants when it is most critical for irrigation, and so will have an adverse economic impact on these farming businesses, but are at a level that these businesses feel able to absorb. Any further increase in residual or minimum flows will increase the level of adverse economic effects on these businesses.

8.7 Effects on other water users

All permit holders within the Pigburn are included within this application. This approach has enabled consideration of any potential effects of any proposal on other water users within this sub-catchment.

The consent for the shared take from the Pigburn (Consent 2000.136) currently includes a condition: *“That this right shall not be exercised except when there is continuous surface flow in the Pigburn from Patearoa-Hamiltons Road to the Taieri River.”*

The recommending report for that permit (ORC Recommending Report 2000/481, 23 August 2000) noted that this condition was “to ensure that the abstraction from the headwaters of the Pigburn did not impinge on the rights of the mining privilege holders and did not affect fisheries values of the

creek.” This is no longer considered necessary by the other permit holders – it is clear that this take does not impact the ability of other permit holders to access their water – instead it is the characteristics of the Pigburn in the lower reaches which primarily affect the other permit holders access to water. The reason for not requiring a residual flow at this point of take is discussed in Section 8.1 above.

The approach proposed in this application has been developed and accepted by all consent holders in the Pigburn. There will be greater effects on some abstractors within the Pigburn, as a result of their location along the waterway purely in relation to the hydrology such as the losing and gaining reaches. This is clear with the Herlihy Ford take, which will be most impacted by a higher residual flow condition, and also the Proposed Combined Take, with a reduced rate of abstraction and a residual flow condition. However, this is accepted by the applicants as necessary for the benefit of the ecological values, natural character and cultural values associated with the Pigburn.

The system of priorities that previously existing between these applicants (particularly those in the lower reaches of the Pigburn) is not being carried through explicitly into the proposed consents. However, the Herlihy and Weir families are in the process of developing a binding side agreement which will recognise the priority that the Weir take has over the Herlihy Gorge take, and the manner in which this priority has been exercised over the last decade.

Effects on other water users in the wider Taieri catchment will be managed by the imposition of the minimum flow at Waipiata. This ensures that the Pigburn will contribute to upholding the minimum flow at Waipiata and ensures a level of equity within the wider catchment.

8.8 Effects of Transfer of Location

The applicants propose to amalgamate the Mulholland and Concept South Takes (at the existing take location for the Concept South Take) during times of high to moderate flows. At times of low flows abstraction from the Herlihy Ford take would be shifted to this Proposed Combined Take point also. This would ensure higher flows remain in the upper gaining reach to prevent dewatering of this reach. Water from the Proposed Combined Take will be shared between the permit holders abstracting at that point. The rate of take from this Proposed Combined Take point would be capped at 60 l/s at all times.

As outlined in Section 8.1, abstraction from the Proposed Combined Take is anticipated to reduce the extent and duration of drying in the lower losing reach. It is also expected that the rate of drying in the lower losing reach will be reduced.

Accordingly the transfer of location of the Herlihy Ford Take (during moderate to higher flows) and the Mulholland Take (at all times) to the Proposed Combined Take location (at the existing location of the Concept South take) is anticipated to provide positive effects on instream flows and instream aquatic values, and therefore also having positive effects on cultural, recreational, amenity and natural character values, when compared with current regime of abstraction.

Water will be used within the same catchment as it is currently used, and water will still be used for the same purpose. The transfer will not have any adverse effects on downstream users.

The effects of ceasing these permits altogether would result in the loss of access to primary allocation surface water from the Taieri catchment. This loss would result in adverse effects on these farms, including loss of productivity and being more vulnerable during dry periods. It would also create an unequitable situation with other permit holders in the catchment who are successful in replacing their permits. The effects of ceasing these permits altogether would benefit flows and instream ecology in the Pigburn and Taieri River, but only if other downstream permit holders were not abstracting this water.

9. Summary of Proposed Mitigation Measures

The proposed mitigation options are described in Section 8 above, and can be summarized as follows:

1. Establishment of a Proposed Combined Take Point located at the existing point of take for the Concept South Take:
 - Allocation for Mulholland and Concept South Takes to be taken at the Proposed Combined Take at all flows
 - Allocation for Herlihy Ford take to also be taken from the Proposed Combined Take (in combination with Mulholland and Concept South allocation) during low flows.
2. Capped Rate of abstraction at Proposed Combined Take Point
 - No more than 60l/s taken at Proposed Combined Take Point. This is a significant decrease from historic maximum abstraction from 111.2l/s (the combined rate of the Mulholland and Concept South takes based on historic maximum rates of take) and 203.2l/s (the combined rate of the Mulholland, Concept South and Herlihy Ford takes based on historic maximum rates of take).
3. Residual Flows:
 - Shared Take - No residual flow is proposed as it naturally dries at the intake each summer.
 - Bradfield Take - No residual flow is proposed as the take is small (<7l/s) relatively to the size of the Pig Burn with the lowest daily average flow recorded downstream of the take of 31 l/s.
 - Herlihy Gorge Take- No residual flow is recommended as natural losses in this reach restrict the taking during low flows naturally.
 - Weir Take - No residual flows are recommended as natural losses in this reach restrict the taking during low flows naturally.
 - Herlihy Ford Take – A maximum rate of abstraction at 70 l/s and a residual flow of 70l/s is proposed. It is expected that this residual flow will ensure the gaining reach from the Hamilton Runs Ford to the Proposed Combined Take will flow continuously.
 - Higher Flows Proposed Combined Take (Concept South and Mulholland) – A residual flow of 10l/s is proposed. It is expected that this residual flow in combination with the maximum rate of take being capped at 60l/s will reduce the extent and duration of drying in the lower losing reach. By leaving a residual flow it is also expected that the rate of drying in the lower losing reach will be reduced.
 - Low Flows Proposed Combined Take (Herlihy, Concept South and Mulholland) – A residual flow of 10l/s is proposed. It is expected that this residual flow in combination with the maximum rate of take being capped at 60l/s will reduce the extent and duration of drying in the lower losing reach. It is also expected that the rate of drying in the lower losing reach will be reduced.

- Concept North Take - A residual flow of 10l/s is recommended. It is expected that this residual flow will ensure the lower gaining reach from O'Neill Road to the Taieri confluence will flow continuously.
4. Fish screening:
 - Fish screening is proposed on all intakes.
 5. Low flow management:
 - Proposed Combined Take, residual flows and minimum flow will ensure effective management of abstraction at low flows.
 6. Minimum flow
 - All takes are proposed to be subject to the Taieri minimum flow at Waipiata.

10. Consultation with Affected Parties

Due to the short time frame before the expiry of the Shared Take Permit (August 2020), consultation has not been undertaken with affected parties. Affected parties are anticipated to be the Department of Conservation, Aukaha, and Fish and Game Otago.

11. Term of Consent and Lapse Period

The applicants request a term of 35 years for all replacement consents that form part of this application. This request is based on the rationale set out in relation to Policy 6.4.19 in Section 6.4.7 of this application.

The applicants seek the standard lapse period of five years on each replacement permit.

12. Consent Conditions

12.1 Shared Take: DCFT/Tearoa Farm, Pigburn Gorge, Smith

12.1.1 Take and Re-take permit

Our Reference: Consent No. RM

WATER PERMIT

Pursuant to Section 104C of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Name: Natasha Lee Burrell, Ian Joseph Burrell and Canterbury Trustees (2016) Limited being trustees of the Duncan Cleugh Farming Trust (Names of trustees updated 1 October 2018) (1/3 share)

Address: c/- Polson Higgs, 139 Moray Place, Dunedin

Name: Pig Burn Gorge Limited 1/3 share

Address: Andrew P Hayes Limited, Central Chambers, 19 Eden Street, Oamaru

Name: Janine Ruth Smith 1/3 share

Address: c/- Fraser MacDonald Martin & Co, 13 Pery Street, Ranfurly

Purpose: To take and use surface water as primary allocation from an unnamed tributary of the Pig Burn, and to retake from a tributary of the Taieri River known locally as Harpers Creek for the purpose of irrigation, domestic use and stock drinking water.

For a term expiring: *[35 years from date of issue]*

Location of point of abstraction: Take: unnamed tributary of the Pig Burn, Rock and Pillar Range, approximately 7 kilometres south of the intersection of Roberts Road and Hamiltons Road

Retake: unnamed tributary of the Taieri River known locally as Harpers Creek, approximately **2.25 km south west** of the intersection of Roberts Road and Hamiltons Road

Legal description of land at point of abstraction:

Lease under s83 Land Act 1948, 1/1, Run 204D

Legal description of land where water is to be used:

Pigburn Gorge Ltd: Section 18 Block IV Upper Taieri Survey District, Section 6 Block IV Upper Taieri Survey District

Duncan Cleugh Farming Trust: Part Section 23 Block IV Upper Taieri Survey District and Section 2 Block VIII Upper Taieri Survey District

Smith: Section 1 Block IV Upper Taieri Survey District, Lot 1 Deposited Plan 415149, Section 14 Block IV Upper Taieri Survey District

Map Reference at point of abstraction:

Take from Pigburn: NZTM 2000 E1372797 N4978227

Re-take from Harpers Creek: NZTM 2000 E1372426 N4983118

Conditions

Specific

1. This consent must not commence until Consents 2000.136, 2000.244 and 2000.245 have been surrendered or expired.
2. The rate of abstraction must not exceed:
 - a. 56 litres per second
 - b. 500,000m³ during the period from 1 July to 30 June in the following year.
3. Abstraction under this consent must not occur from this point of take when flows in the Taieri River are equal to or less than 1,000l/s at the Otago Regional Council's Waipiata flow site (*insert map reference*). This condition will only be implemented upon collective review of consent conditions within the Taieri catchment under Sections 128 to 132 of the Resource Management Act.

12.1.2 Discharge Permit

Our Reference:

Consent No. RM

DISCHARGE PERMIT

Pursuant to Section 105 of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Name: Natasha Lee Burrell, Ian Joseph Burrell and Canterbury Trustees (2016) Limited being trustees of the Duncan Cleugh Farming Trust (Names of trustees updated 1 October 2018) (1/3 share)

Address: c/- Polson Higgs, 139 Moray Place, Dunedin

Name: Pig Burn Gorge Limited (1/3 share)

Address: Andrew P Hayes Limited, Central Chambers, 19 Eden Street, Oamaru

Name: Janine Ruth Smith 1/3 share

Address: c/- Fraser MacDonald Martin & Co, 13 Pery Street, Ranfurly

Purpose: To discharge water taken from the Pigburn under Consent X to an unnamed tributary of the Taieri River known locally as Harpers Creek, for the purpose of subsequent re-taking for the purpose of irrigation, domestic use and stock drinking water.

For a term expiring: *[35 years from date of issue]*

Location of activity: unnamed tributary of the Taieri River known locally as Harpers Creek, approximately 4.8 km south of the intersection of Roberts Road and Hamiltons Road

12.2 Bradfields Take

Our Reference:

Consent No. RM

WATER PERMIT

Pursuant to Section 104C of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Name: En Hakkore Limited

Address: Deloitte Touche Tohmatsu, Level 8, Otago House, 481 Moray Place, Dunedin

Purpose: To take and use surface water as primary allocation from the Pig Burn for the purpose of irrigation, stock drinking water and domestic supply.

For a term expiring: *[35 years from date of issue]*

Location of point of abstraction:

The Pig Burn, Rock and Pillar Range, approximately 3.6km south east of the of the intersection of Roberts Road and Hamiltons Road

Legal description of land at point of abstraction:

Reserve through Part Run 204B Block I Rock & Pillar SD

Legal description of land where water is to be used:

Sec 64 Block I and Section 65 Block I Rock & Pillar SD and Part Sec 66, 81 Block I Rock & Pillar SD

Map reference at point of abstraction: NZTM2000 E1374521 N4981919

Conditions

Specific

1. This consent must not commence until Consent 2002.0101 has been surrendered or has expired.
2. The rate of abstraction must not exceed:
 - a. 7 litres per second
 - b. 70,000m³ during the period from 1 July to 30 June in the following year.
3. Abstraction authorised by this consent must not occur from this point of take when flows in the Taieri River are equal to or less than 1,000l/s at the Otago Regional Council's Waipiata flow site (*insert map reference*). This condition will only be implemented upon collective review of consent conditions within the Taieri catchment under Sections 128 to 132 of the Resource Management Act.

12.3 Herlihy Takes

12.3.1 Herlihy Gorge Take

Our Reference: Consent No. RM

WATER PERMIT

Pursuant to Section 104C of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Name: Greenbank Pastoral Limited

Address: C/- Ibboston Cooney Limited, Level 1, 69 Tarbert Street, Alexandra

Purpose: To take and use surface water as primary allocation from the Pig Burn for the purpose of irrigation, stock drinking water and dairy shed use.

For a term expiring: *[35 years from date of issue]*

Location of point of abstraction:

Pig Burn, Approximately 1.6 kilometres south east of the intersection of Roberts Road and Hamilton Road, Patearoa

Legal description of land at point of abstraction:

Pt Run 204B

Legal description of land where water is to be used:

Lot 2 DP 441480 Sec 13 Blk 4 Upper Taieri

Reference at point of abstraction: NZTM2000 E1374119 N4983920

Conditions

Specific

1. This consent must not commence until Consent 96394 has been surrendered or has expired.
2. The rate of abstraction must not exceed:
 - a. 42 litres per second
 - b. 454,120m³ during the period from 1 July to 30 June in the following year.
3. Abstraction authorised by this consent must not occur from this point of take when flows in the Taieri River are equal to or less than 1,000l/s at the Otago Regional Council's Waipiata flow site (*insert map reference*). This condition will only be implemented upon collective review of consent

conditions within the Taieri catchment under Sections 128 to 132 of the Resource Management Act.

12.3.2 Herlihy Ford Take

Our Reference:

Consent No. RM

WATER PERMIT

Pursuant to Section 104C of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Name: Hamiltons Dairy Limited

Address: C/o Ibbotson Cooney Limited, Level 1, 69 Tarbert Street, Alexandra

Purpose: To take and use surface water as primary allocation from the Pig Burn for the purpose of irrigation, dairy shed use and stock drinking water.

For a term expiring: *[35 years from date of issue]*

Location of point of abstraction:

Pig Burn, immediately adjacent to Hamilton Road, approximately 348 metres north east of the intersection of Hamilton Road and Roberts Road, Patearoa.

Legal description of land at point of abstraction: Pt Run 204B

Legal description of land where water is to be used:

Lot 1 DP 397751, Lot 1 DP 431784, Lot 1 DP 500044 Sec 48 Blk 1 Sec 12, Blk II Upper Taieri SD, Sec 18 Blk XIII Maniototo SD, Lots 2-5,7-9 84DP 4317, Sec 4 SD 24830, Sec 7 Blk I Upper Taieri SD, Sec 14 Blk XIII Maniototo SD, Lot 2 DP 427338, Lot 1 DP 441480 Upper Taieri SD

Reference at point of abstraction: NZTM2000 E1373417 N4985319

Conditions

Specific

1. This consent must not commence until Consent 96230.V1 has been surrendered or has expired.
2. The rate of abstraction must not exceed:
 - a. 70 litres per second
 - b. 459,875m³ during the period from 1 July to 30 June in the following year, as a combined total with the annual volume authorised to be taken by Hamiltons Dairy Ltd by Consent XXX *[insert consent number for Proposed Combined Take]*
3. The consent holder must not take water under this consent at the same time as taking water under Consent XXX *[insert Consent number for Proposed Combined Take]*. This condition only applies to abstraction undertaken by Hamiltons Dairy Limited under Consent XXX *[insert Consent number for Proposed Combined Take]*.

4. Other than for exercising this consent for reasonable domestic and stock drinking water purposes the consent holder must not take water under this consent unless there is a residual flow of 70 litres per second immediately below the point of take.

5. Abstraction authorised by this consent must not occur from this point of take when flows in the Taieri River are equal to or less than 1,000 l/s at the Otago Regional Council's Waipiata flow site (*insert map reference*). This condition will only be implemented upon collective review of consent conditions within the Taieri catchment under Sections 128 to 132 of the Resource Management Act.

12.4 Weirs

Our Reference:

Consent No. RM

WATER PERMIT

Pursuant to Section 104C of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Name: Hamilton Runs Limited

Address: C/- Ibbotson Cooney Limited, Level 1, 69 Tarbert Street, Alexandra

Purpose: To take and use surface water as primary allocation from the Pig Burn for the purpose of irrigation and stock drinking water.

For a term expiring: *[35 years from date of issue]*

Location of point of abstraction:

Pigburn, approximately 450m upstream of Hamilton's Road, Waipiata

Legal description of land at point of abstraction: Crown land Blk IV Upper Taieri Survey District, SO 1827

Legal description of land where water is to be used: Secs 7,8, 9-10, 11, 21,22 Block IV Upper Taieri SD, Part Run 204b and Sec 25-26 Block IV Upper Taieri SD, Sec 16-18 and Part Sec 15 Block XIV Maniototo SD, Lot 2 DP 313479 and Sec 35 Block I and Secs 62, 67, 69, 71, 75-76, 79-80, 85-87, 89 Block I Rock & Pillar SD

Reference at point of abstraction: NZTM2000 E1373719 N4985082

Conditions

Specific

1. This consent must not commence until Consent 97210 has been surrendered or has expired.
2. The rate of abstraction must not exceed:
 - a. 55.6 litres per second
 - b. 895,000m³ during the period from 1 July to 30 June in the following year.
3. Abstraction authorised by this consent must not occur from this point of take when flows in the Taieri River are equal to or less than 1,000 l/s at the Otago Regional Council's Waipiata flow site (insert map reference). This condition will only be implemented upon collective review of consent conditions within the Taieri catchment under Sections 128 to 132 of the Resource Management Act.

12.5 Proposed Combined Take – Herlihy, Concept Farms Ltd and Mulholland

Our Reference: Consent No. RM

WATER PERMIT

Pursuant to Section 104C of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Name: Concept Farms Ltd
Address: PO Box 5241, Dunedin, 9054

Name: Christopher Patrick Mulholland and Dale Evelyn Mulholland (referred to hereafter as “Mulholland”)
Address: Ranfurly-Patearoa Road, RD 4, Ranfurly

Name: Hamiltons Dairy Limited
Address: C/o Ibbotson Cooney Limited, Level 1, 69 Tarbert Street, Alexandra

Purpose: To take and use surface water as primary allocation from the Pig Burn for the purpose of irrigation, stock drinking water and diary shed use.

For a term expiring: *[35 years from date of issue]*

Location of point of abstraction:

Pig Burn, approximately 930 metres north northwest of the intersection of Roberts Road and Hamilton Road, Waipiata, Maniototo

Legal description of land at point of abstraction:

Marginal Strip (Crown land Blk IV Upper Taieri Survey District, SO12392) adjacent to Sec 25, Blk IV Upper Taieri Survey District.

Legal description of land where water is to be used:

Concept Farms Ltd: Sec 19, 31 and Pt Sec 32 Blk XIV Maniototo SD and Sec 2 SO 24830, Sec 11 and Sec 12 Blk XIV Maniototo SD, Secs 33 – 35 Blk XIV Maniototo SD, Sec 23 Blk XIV Maniototo SD, Pt Lot 3 DP 340765

Mulholland: Sec 1 SO Plan 23520, Section 1 SO Plan 23521, Lot 1 DP 427338

Hamiltons Dairy Limited: Lot 1 DP 397751, Lot 1 DP 431784, Lot 1 DP 500044 Sec 48 Blk 1 Sec 12, Blk II Upper Taieri SD, Sec 18 Blk XIII Maniototo SD, Lots 2-5,7-9 84DP 4317, Sec 4 SD 24830, Sec 7 Blk I Upper Taieri SD, Sec 14 Blk XIII Maniototo SD, Lot 2 DP 427338, Lot 1 DP 441480 Upper Taieri SD

Map reference at point of abstraction:

NZTM2000 E1372833 N4986146

Conditions

Specific

1. This consent must not commence until Consents 96230.V1, 97128 and 2000.498 have been surrendered or expired.
2. The rate of abstraction must not exceed:
 - a. 60 litres per second as a combined total between the consent holders taking water pursuant to this consent.
 - b. 920,655m³ during the period from 1 July to 30 June in the following year by Concept Farms Ltd
 - c. 768,615m³ during the period from 1 July to 30 June in the following year by Mulholland
 - d. 459,875m³ during the period from 1 July to 30 June in the following year by Hamiltons Dairy Limited as a combined total with the annual volume authorised to be taken by Consent XXX [insert consent number for Hamiltons Dairy Limited consent i.e Herlihy Ford Take]
3. Hamiltons Dairy Limited must only take water under this consent when flows immediately below the point of take authorised by Consent XXX [insert consent number for Hamiltons Dairy Limited consent i.e Herlihy Ford Take] located at NZTM2000 E1373417 N4985319 are less than 70 litres per second.
4. Hamiltons Dairy Limited must not take water under this consent at the same time as taking water under Consent XXX [insert Consent number for Proposed Combined Take]. This condition only applies to abstraction undertaken by Hamiltons Dairy Limited, and does not affect the ability of Concept Farms Ltd or Mulholland to take water under this consent.
5. Other than for exercising this consent for reasonable domestic and stock drinking water purposes, the consent holders must not take water under this consent unless there is a residual flow of 10 litres per second immediately below the point of take authorised by this consent.
6. Abstraction authorised by this consent must not occur from this point of take when flows in the Taieri River are equal to or less than 1,000l/s at the Otago Regional Council's Waipiata flow site (insert map reference). This condition will only be implemented upon collective review of consent conditions within the Taieri catchment under Sections 128 to 132 of the Resource Management Act.
7. Within 5 years of this consent being exercised, at least 100 hectares of area on the Mulholland property (Sec 1 SO Plan 23520, Section 1 SO Plan 23521, Lot 1 DP 427338) must be spray irrigated.

12.6 Concept Farms Ltd – North Take

Our Reference: Consent No. RM

WATER PERMIT

Pursuant to Section 104C of the Resource Management Act 1991, the Otago Regional Council grants consent to:

Name: Concept Farms Ltd

Address: PO Box 5241, Dunedin, 9054

Purpose: To take and use surface water as primary allocation from the Pig Burn for the purpose of irrigation, dairy shed use and stock drinking water.

For a term expiring: *[35 years from date of issue]*

Location of point of abstraction:

On the left bank of the Pig Burn, approximately 700 metres upstream of the confluence of the Pig Burn and the Taieri River, Waipiata, Maniototo

Legal description of land at point of abstraction:

Sec 35 Blk XIV Maniototo Survey District

Legal description of land where water is to be used:

Sec 19, Sec 31 and Pt Sec 32 Blk XIV Maniototo SD and Sec 2 SO 24830, Sec 11 and Sec 12 Blk XIV Maniototo SD, Secs 33 – 35 Blk XIV Maniototo SD, Sec 23 Blk XIV Maniototo SD, Pt Lot 3 DP 340765

Reference at point of abstraction: NZTM2000 E1372749 N4990742

Conditions

Specific

1. This consent must not commence until Consent 96254 has been surrendered or has expired.
2. The rate of abstraction must not exceed:
 - a. 42 litres per second
 - b. 1,697,665m³ during the period from 1 July to 30 June in the following year
3. Other than for exercising this consent for reasonable domestic and stock drinking water purposes the consent holder must not take water under this consent unless there is a residual flow of 10 litres per second immediately below the point of take.

4. Abstraction authorised by this consent must not occur from this point of take when flows in the Taieri River are equal to or less than 1,000l/s at the Otago Regional Council's Waipiata flow site (*insert map reference*). This condition will only be implemented upon collective review of consent conditions within the Taieri catchment under Sections 128 to 132 of the Resource Management Act.

12.7 Conditions Attached to all Permits to Take Water

Fish Screens

1. A fish screen must be designed and installed that meets the following requirements:
 - a. Water must only be taken when a fish screen with a mesh size or maximum slot width of 3 mm is operated and maintained across the full width of the intake to ensure that fish and fish fry are prevented from passing through the intake screen;
 - b. as far as possible, the screen area must be designed to ensure the calculated average through-screen velocity does not exceed 0.12 m/s if a self-cleaning mechanism is in place, or 0.06 m/s if no self-cleaning mechanism is in place;
 - c. the sweep velocity parallel to the face of the screen must exceed the design approach velocity; and
 - d. the screening material must have a smooth surface and openings that prevent any damage to fish coming into contact with the screen.
2. Prior to installation of any fish screen, a report containing final design plans and illustrating how the screen will meet the required design criteria and an operation and maintenance plan should be provided to the Consent Authority.
3. The fish screen required by Condition 1 must be maintained in good working order, to ensure that the screen is performing as designed. Records must be kept of all inspections and maintenance and these should be made available to the Consent Authority, on request.

Performance Monitoring

4. The consent holder must:
 - a. 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. install and use a datalogger that shall record the date, time and flow in litres per second.
 - c. provide data 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

5. The consent holder shall take all practicable steps to ensure that there is no leakage from pipes and structures.

Appendix A: Certificates of Title

1. Weirs - Hamiltons Runs Ltd

1/30/2020

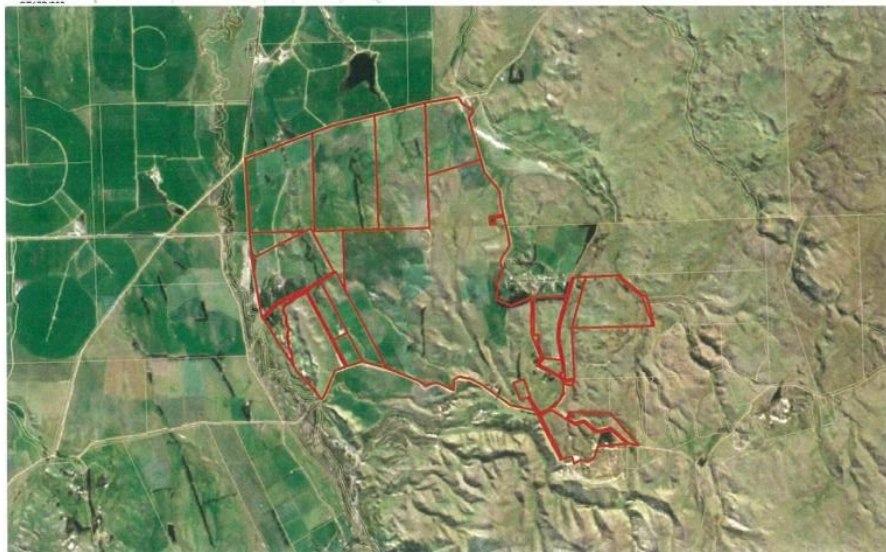
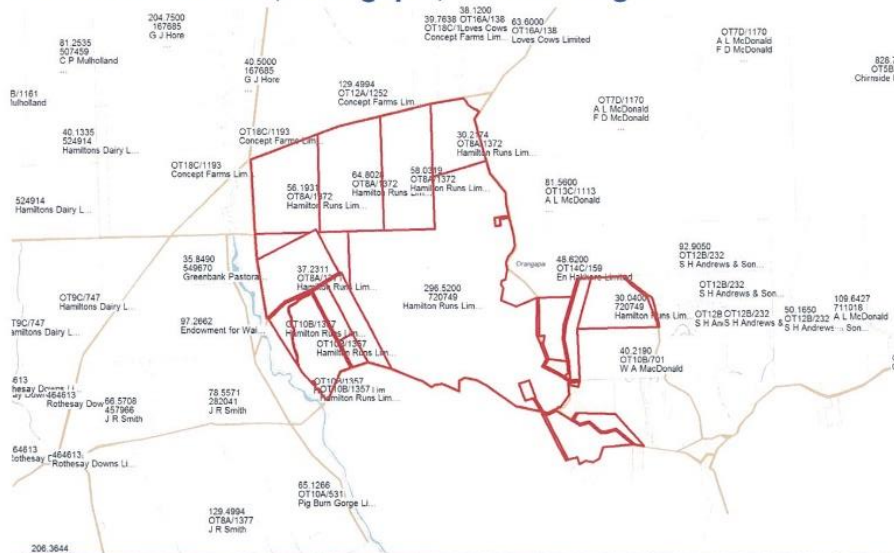
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784 Patearoa Road, Orangapai, Central Otago





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Title Details - 784 Patearoa Road, Orangapai, Central Otago

Information last updated as at 27-Jan-2020

RECORD OF TITLE DERIVED FROM LAND INFORMATION NEW ZEALAND FREEHOLD



Identifier OT8A/1371
Land Registration District Otago
Date Issued 07 December 1979

Prior References

OT391/12

Type Fee Simple
Area 41.8850 hectares more or less
Legal Description Section 9-10 Block IV Upper Taieri Survey District

Registered Owners

Hamilton Runs Limited

937292.1 Certificate Specifying Mining Rights under s417 (2) Resource Management Act 1991 - 30.9.1997 at 12:22 pm
937292.1 Certificate under Section 417 (2) Resource Management Act 1991 to (now) Stationview Farm Limited - 30.9.1997 at 12:22 pm
5448471.4 Mortgage to (now) Westpac New Zealand Limited - 24.12.2002 at 9:00 am
7791858.1 Variation of Mortgage 5448471.4 - 22.4.2008 at 9:00 am



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RECORD OF TITLE DERIVED FROM LAND INFORMATION NEW ZEALAND FREEHOLD



Identifier OT8A/1376
Land Registration District Otago
Date Issued 07 December 1979

Prior References

OT383/159

Type Fee Simple
Area 6.8670 hectares more or less
Legal Description Section 22 Block IV Upper Taieri Survey District

Registered Owners

Hamilton Runs Limited

Subject to Section 59 Land Act 1948

937292.1 Certificate Specifying Mining Rights under s417 (2) Resource Management Act 1991 - 30.9.1997 at 12:22 pm

937292.1 Certificate under Section 417 (2) Resource Management Act 1991 to (now) Stationview Farm Limited - 30.9.1997 at 12:22 pm

5448471.4 Mortgage to (now) Westpac New Zealand Limited - 24.12.2002 at 9:00 am

7791858.1 Variation of Mortgage 5448471.4 - 22.4.2008 at 9:00 am



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RECORD OF TITLE DERIVED FROM LAND INFORMATION NEW ZEALAND FREEHOLD



Identifier OT8A/1372
Land Registration District Otago
Date Issued 07 December 1979

Prior References

OT391/4

Type Fee Simple
Area 209.2452 hectares more or less
Legal Description Section 16-18 and Part Section 15 Block XIV Maniototo Survey District

Registered Owners

Hamilton Runs Limited

752174 CAVEAT BY MANITOTO EASTSIDE IRRIGATION COMPANY LIMITED - 12.4.1990 AT 10.04 AM

937292.1 Certificate Specifying Mining Rights under Section 417 (2) Resource Management Act 1991 - 30.9.1997 at 12.22 pm

937292.1 Certificate under Section 417 (2) Resource Management Act 1991 to (now) Stationview Farm Limited - 30.9.1997 at 12:22 pm

5448471.4 Mortgage to (now) Westpac New Zealand Limited - 24.12.2002 at 9:00 am

7791858.1 Variation of Mortgage 5448471.4 - 22.4.2008 at 9:00 am



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RECORD OF TITLE DERIVED FROM LAND INFORMATION NEW ZEALAND FREEHOLD



Identifier OT8A/1373
Land Registration District Otago
Date Issued 07 December 1979

Prior References

OT156/51

Type Fee Simple
Area 9.3078 hectares more or less
Legal Description Section 21 Block IV Upper Taieri Survey District

Registered Owners

Hamilton Runs Limited

5448471.4 Mortgage to (now) Westpac New Zealand Limited - 24.12.2002 at 9:00 am
7791858.1 Variation of Mortgage 5448471.4 - 22.4.2008 at 9:00 am

1/30/2020

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RECORD OF TITLE DERIVED FROM LAND INFORMATION NEW ZEALAND FREEHOLD



Identifier OT8A/1374
Land Registration District Otago
Date Issued 07 December 1979

Prior References

OT88/120

Type Fee Simple
Area 17.4015 hectares more or less
Legal Description Section 8 Block IV Upper Taieri Survey District

Registered Owners

Hamilton Runs Limited

5448471.4 Mortgage to (now) Westpac New Zealand Limited - 24.12.2002 at 9:00 am

7791858.1 Variation of Mortgage 5448471.4 - 22.4.2008 at 9:00 am



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RECORD OF TITLE DERIVED FROM LAND INFORMATION NEW ZEALAND FREEHOLD



Identifier OT8A/1375
Land Registration District Otago
Date Issued 07 December 1979

Prior References

OT39/82

Type Fee Simple
Area 8.3947 hectares more or less
Legal Description Section 7 Block IV Upper Taieri Survey District

Registered Owners
Hamilton Runs Limited

5448471.4 Mortgage to (now) Westpac New Zealand Limited - 24.12.2002 at 9:00 am
7791858.1 Variation of Mortgage 5448471.4 - 22.4.2008 at 9:00 am



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RECORD OF TITLE DERIVED FROM LAND INFORMATION NEW ZEALAND FREEHOLD



Identifier OT10B/1357
Land Registration District Otago
Date Issued 05 December 1985

Prior References

OT110/85

Type Fee Simple
Area 40.6431 hectares more or less
Legal Description Section 11 Block IV Upper Taieri Survey District

Registered Owners

Hamilton Runs Limited

Subject to Section 8 Mining Act 1971

Subject to Section 5 Coal Mines Act 1979

5448471.4 Mortgage to (now) Westpac New Zealand Limited - 24.12.2002 at 9:00 am

7791858.1 Variation of Mortgage 5448471.4 - 22.4.2008 at 9:00 am



Title Details - 784 Patearoa Road, Orangapai, Central Otago

Information last updated as at 27-Jan-2020

RECORD OF TITLE DERIVED FROM LAND INFORMATION NEW ZEALAND FREEHOLD



Identifier 720749
Land Registration District Otago
Date Issued 23 November 2015

Prior References

53227

Type	Fee Simple
Area	389.5798 hectares more or less
Legal Description	Lot 2 Deposited Plan 313479 and Section 35 Block I and Section 62, 67, 69, 71, 75-76, 79-80, 85-87, 89 Block I Rock & Pillar Survey District

Registered Owners

Hamilton Runs Limited

935468.1 Certificate pursuant to s417(2) Resource Management Act 1991 to (now) Hamilton Runs Limited - 27.8.1997 at 11:28 am (affects Section 67 Block I Rock & Pillar Survey District)

Appurtenant to Section 67 Block I Rock & Pillar Survey District is a water pipeline easement created by Deed of Easement 956380.1 - 22.10.1998 at 11:47 am

Appurtenant hereto is a right to take, convey & lead water for a term of 60 years commencing 1.10.1998 created by Transfer 5002936.1 - 2.6.2000 at 9:00 am

Appurtenant hereto is a right to convey water created by Deed of Easement 5325921.1 (CT 58067) - 28.8.2002 at 9:00 am

Appurtenant to lot 2 DP 313479 is a right to convey water created by Transfer 5503616.3 - 28.2.2003 at 9:00 am

Appurtenant to lot 2 DP 313479 is a right to convey water created by Transfer 5503616.4 - 28.2.2003 at 9:00 am

Subject to rights to convey water over Section 35 Block I Rock & Pillar Survey District marked H and over Section 62 Block I Rock & Pillar Survey District marked A and over Section 67 Block I Rock & Pillar Survey District marked F, G and over Section 80 Block I Rock & Pillar Survey District marked B and over Lot 2 DP 313479 marked J all on DP 313479 created by Transfer 5589203.2 - 16.5.2003 at 9:00 am

Subject to Part IV A Conservation Act 1987

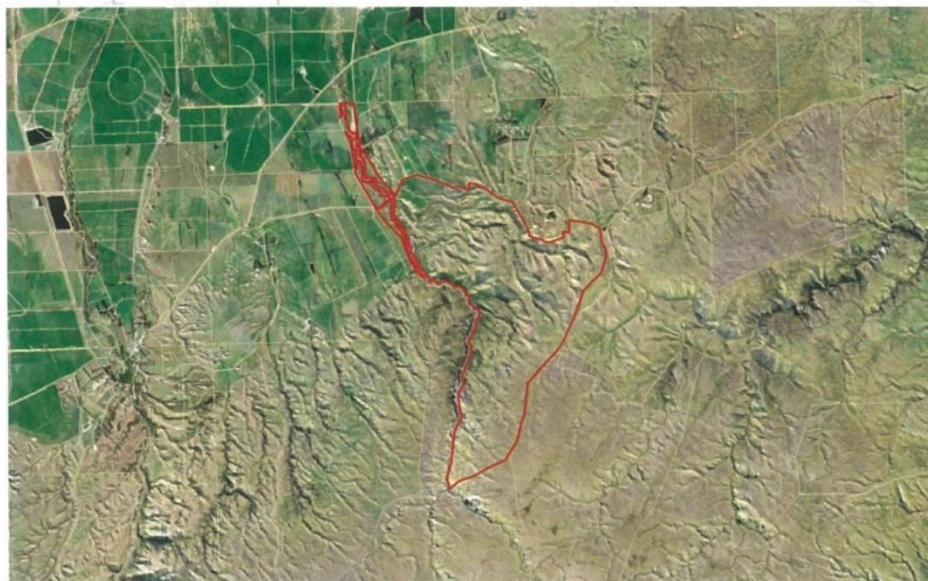
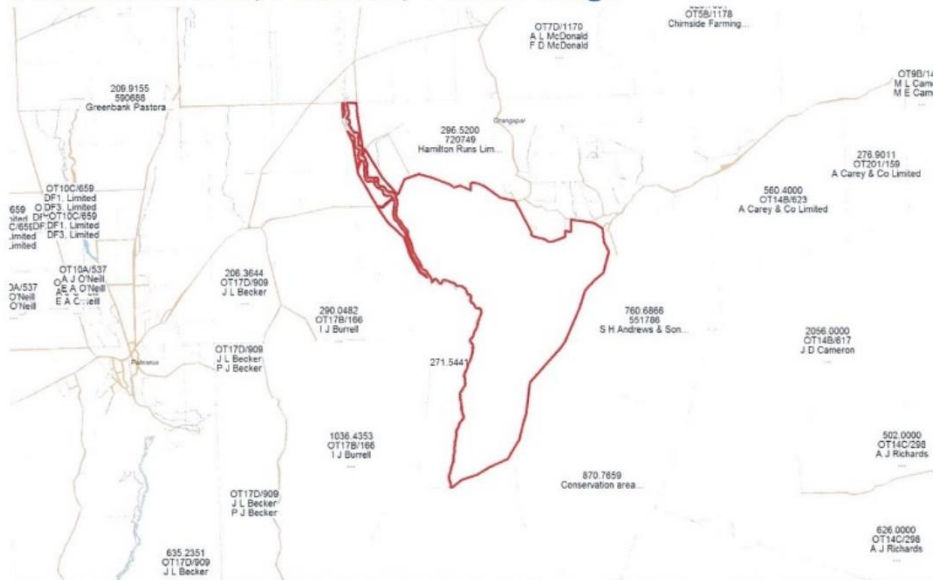
10313646.4 Mortgage to Westpac New Zealand Limited - 29.1.2016 at 10:35 am

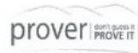


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Title Details - 0 Hamilton Road, Patearoa, Central Otago

Information last updated as at 27-Jan-2020

RECORD OF TITLE DERIVED FROM LAND INFORMATION NEW ZEALAND LEASEHOLD



Identifier OT386/60
Land Registration District Otago
Date Issued 24 October 1957 11:33 a.m.

Prior References

OT336/90

Estate	Lease under s83 Land Act 1948		
Area	1,067.5607 hectares more or less	Term	Thirty-three years commencing on the first day of July 1957 and renewed for a further period of 33 years commencing on the 1.7.1990

Legal Description Part Run 204b and Section 25-26 Block IV Upper Taieri Survey District

Registered Owners

Hamilton Runs Limited

Subject to Part IVA Conservation Act 1987

392949 Compensation Certificate pursuant to Section 17 Public Works Amendment Act 1948 - 4.10.1972 at 2.11 pm

645939.1 Transfer creating the following easement - 24.10.1985 at 9.59 am

Type	Servient Tenement	Easement Area	Dominant Tenement	Statutory Restriction
Water	Part Run 204b and Section 25-26 Block IV Upper Taieri Survey District - herein	Line B Transfer 645939.1	Section 14 Block IV Upper Taieri Survey District - CT OT110/83	

761385 Memorandum renewing the term of the within lease for a further period of 33 years commencing on the 1.7.1990 and fixing (for the first 11 years) the annual rent at \$1,125.00 calculated on a rental value of \$167,000.00 - 21.8.1990 at 9.35 am

916504.1 Certificate Specifying Mining Rights under s417 (2) Resource Management Act 1991 - 19.9.1996 at 1.41 pm

935468.1 Certificate under Section 417 (2) Resource Management Act 1991 to (now) Hamilton Runs Limited - 27.8.1997 at 11:28 am

937292.1 Certificate Specifying Mining Rights under s417 (2) Resource Management Act 1991 - 30.9.1997 at 12.22 pm

937292.1 Certificate under Section 417 (2) Resource Management Act 1991 to (now) Stationview Farm Limited - 30.9.1997 at 12:22 pm

Subject as to the fee simple to a Right to Convey Water over part marked B on SO 21966 created by Deed of Easement 5325921.1 (CT 58067) - 28.8.2002 at 9:00 am

5448471.2 Variation of the within Lease - 24.12.2002 at 9:00 am

5448471.4 Mortgage to (now) Westpac New Zealand Limited - 24.12.2002 at 9:00 am

7791858.1 Variation of Mortgage 5448471.4 - 22.4.2008 at 9:00 am

9751361.1 Advice under section 231(6) of the Crown Pastoral Land Act 1998 that the base carrying capacity of the within pastoral

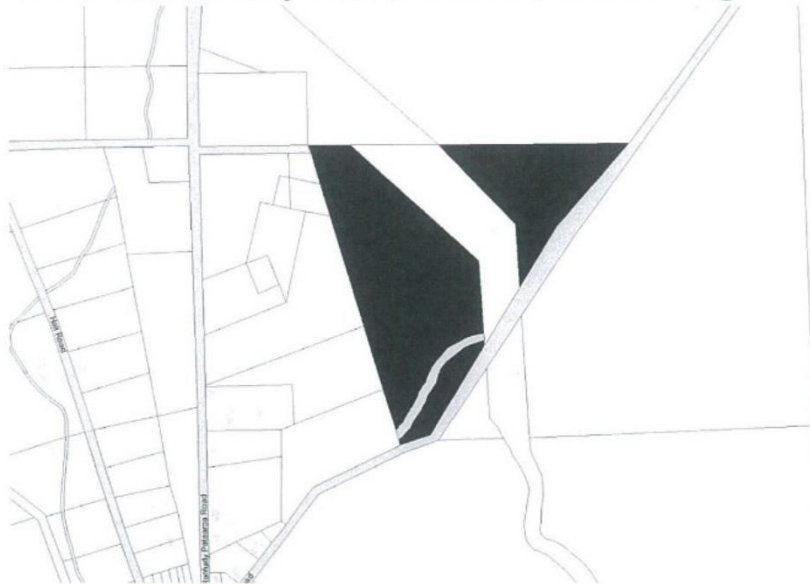
1/30/2020

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lease is 251 stock units - 11.6.2014 at 7:00 am

10329195.1 Notice of Access Rights pursuant to Section 83 Crown Minerals Act 1991 (affects the freehold register owned by Her Majesty The Queen) - 10.2.2016 at 7:00 am

0 Patearoa Ranfurly Road, Patearoa, Central Otago



Legal Description

Section 18 Block I Upper Taieri Survey District

Owners

Hamilton Runs Limited

Property Information

Roof Unknown - Unknown

Wall Unknown - Unknown

Category Pastoral, Fattening,
Uneconomic Farmlet without
Homestead

Age Unknown

Building use Stock Fattening

Bedrooms 0

New Residence

Land Area 20.1331 ha

Floor Area

Current Valuation

Valref 28320-07900

Capital Value \$240,000

Land Value \$235,000

Valuation Date 1 September 2019 **Improvements** FG

Council Central Otago District

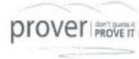


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Title Details - 0 Patearoa Ranfurly Road, Patearoa, Central Otago

Information last updated as at 27-Jan-2020

RECORD OF TITLE DERIVED FROM LAND INFORMATION NEW ZEALAND FREEHOLD



Identifier OT13D/984
Land Registration District Otago
Date Issued 04 October 1991

Prior References

OT111/50

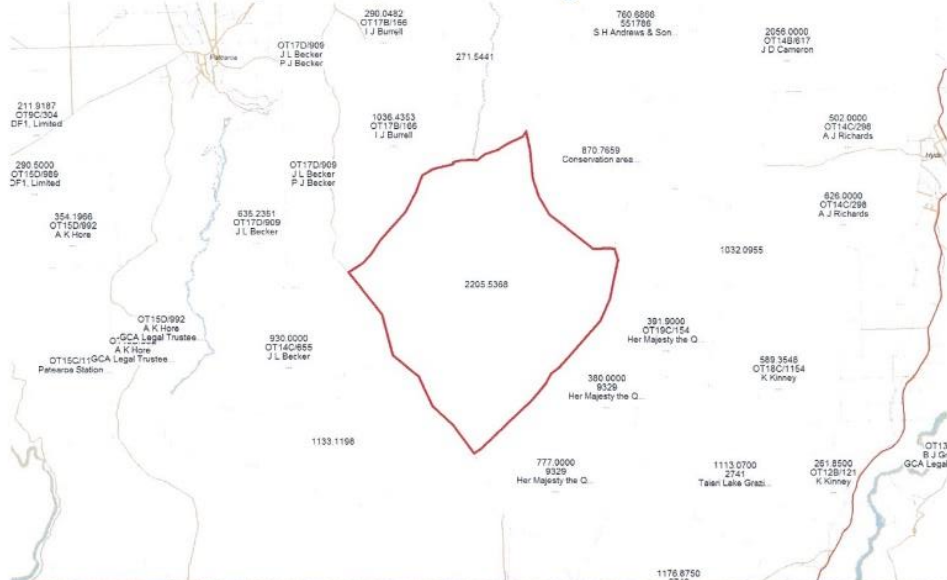
Type Fee Simple
Area 20.1331 hectares more or less
Legal Description Section 18 Block I Upper Taieri Survey District

Registered Owners

Hamilton Runs Limited

Subject to Section 3 Petroleum Act 1937
Subject to Section 8 Atomic Energy Act 1945
Subject to Section 3 Geothermal Energy Act 1953
Subject to Section 6 and 8 Mining Act 1971
Subject to Section 5 Coal Mines Act 1979
Subject to Section 261 Coal Mines Act 1979
Subject to Part IV A Conservation Act 1987

0 Hamilton Road, Paerau, Central Otago





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Title Details - 0 Hamilton Road, Paerau, Central Otago

Information last updated as at 27-Jan-2020

RECORD OF TITLE DERIVED FROM LAND INFORMATION NEW ZEALAND LEASEHOLD



Identifier OT386/123
Land Registration District Otago
Date Issued 20 August 1959 11:42 a.m.

Prior References

OT335/179

Estate	Lease under s83 Land Act 1948	Term	Thirty-three years commencing on the first day of July 1959 and renewed for a further 33 years
Area	2,205.5368 hectares more or less		

Legal Description Run 204D

Registered Owners

Frazer Donald McDonald as to a 1/4 share
Hamilton Runs Limited as to a 3/4 share

Subject to Part IVA Conservation Act 1987

841857 Renewal of lease for a further term of 33 years and fixing (for the first 11 years) the annual rent at \$975.00 calculated on a rental value of \$65,000.00 - 4.11.1993 at 9:17 am

5448471.1 Variation of the within Lease - 24.12.2002 at 9:00 am

5448471.4 Mortgage of the share of Hamilton Runs Limited to (now) Westpac New Zealand Limited - 24.12.2002 at 9:00 am

7791858.1 Variation of Mortgage 5448471.4 - 22.4.2008 at 9:00 am

9723121.1 Advice under section 231(6) of the Crown Pastoral Land Act 1998 that the base carrying capacity of the within pastoral lease is 261 stock units - 12.5.2014 at 7:00 am

10313646.5 Mortgage to Westpac New Zealand Limited - 29.1.2016 at 10:35 am

Appendix B: Photos of Water Takes and Use

1. Shared Take, Discharge Point, Retake (Existing Consents 2000.136, 2000.244, 2000.245)



Photo 1.1: Shared Take intake from Pigburn, showing Pigburn at point of take and looking downstream at the race



Photo 1.2: Shared Take intake from Pigburn looking from water race upstream



Photo 1.3: Shared Take - water race intake from Pigburn at intake pipe to the race.

a. Discharge to Harpers Creek



Photo 1.4: Shared Take - Discharge into Harpers Creek – Harpers Creek enters tussocks behind the dog in photo



Photo 1.5: Shared Take – Standing upstream of discharge into Harpers Creek, looking downstream at discharge point. Bike is in the same point in all photos. Harpers Creek drops down into gully behind pool that can be seen at end of race



Photo 1.6: Shared Take – Looking at discharge into Harpers Creek

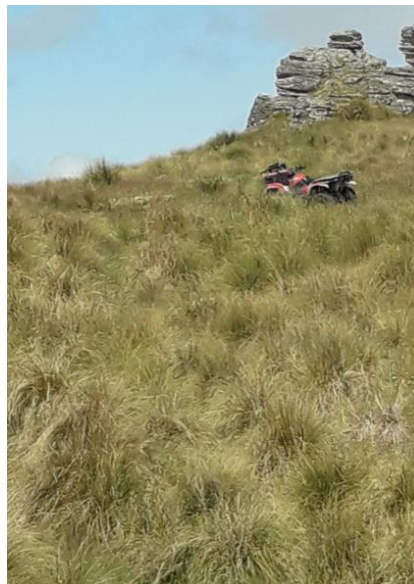


Photo 1.7: Shared Take - Discharge into Harpers Creek – looking back up at discharge point (which is near bike, hidden by tussocks). Harpers Creek drops into the gully through the tussocks.

b. Discharge to Harpers Creek



Photo 1.8: Re-take from Harpers Creek – standing upstream, looking downstream at re-take point (through pipe under rocks at right of photo).



Photo 1.9: Shared Take – Metering Device



Photo 1.10: Irrigation occurring on Smith Farm

2. Bradfield (Existing Consent 2002.0101)



Photo 2.1: Looking upstream of Bradfield Take



Photo 2.2: Bradfield Take – screened intake shown at bottom left



Photo 2.3: Bradfield Take – looking downstream from point of take



Photo 2.4(left) and 2.5(right): Irrigation occurring on En Hakkore

3. Herlihy Gorge (Existing Consent 96394)

Photo 3.1 (right): Herlihy Gorge Intake – standing of point of take looking upstream at Pigburn

Photo 3.2: Herlihy Gorge Intake (below) – standing upstream of take and looking downstream at intake (intake into race flowing at right) and Pigburn (flowing at left)





Photo 3.3: Herlihy Gorge Intake– Gate on race with by-wash back to Pigburn

4. Weirs (Existing Consent 97210)



Photo 4.1: Weirs Point of take – standing across Pigburn looking at race intake via submerged pipe. Pigburn flows from right to left in foreground.



Photo 4.2: Weirs Point of take – standing downstream of intake, looking back upstream at Pigburn. Pigburn flows from left to right diagonally at top of picture

Photo 4.3: Weirs Point of take – looking down race at point of take, submerged pipe intake can be seen in middle of picture



Photo 4.4: Weirs Point of take – looking at Pigburn (flowing right to left in foreground) with intake in background



Photo 4.5: Metering device on Weirs' race



Photo 4.6: Pivot on Hamilton Runs Ltd



Photo 4.7: K-line irrigation on Hamilton Runs Ltd



Photo 4.8 (left) and 4.9 (right): Storage on Hamilton Runs Ltd, with plantings shown around edge of dam in Photo X

5. Herlihy Ford (Existing Consent 96230.V1)



Photo 5.1 (above): Herlihy Ford Take looking downstream from the point of take (Race is flowing on left)

Photo 5.2 (right): Herlihy Ford Take – looking upstream and at point of take



6. Concept South and Proposed Combined Take (Existing Consent 97128)



Photo 6.1: Concept South Take at point of take looking upstream to right.



Photo 6.2: Concept South Take at point of take looking downstream with race on right



Photo 6.3: Mathias Dam on Concept Farms



Photo 6.4: Pumpshed on Concept Farms



Photo 6.5: Mathias Dam on Concept Farms



Photo 6.6: (left) and Photo 6.7:(right): Pivot irrigation on Concept Farms (Roseneath)



Photo 6.8: K-line irrigation on Concept

7. Mulholland (Existing Consent 2000.498)



Photo 7.1: Mulholland Take – showing race intake - Pigburn flowing downstream to right of photo.



Photo 7.2: Mulholland Take – Looking upstream from point of take – water on right flowing to water metering, Pigburn flowing downstream towards bottom centre of photo.

8. Kirkwood North (Existing Consent 96254)



Photo 8.1: Kirkwood North – Point of Take and looking upstream



Photo 8.2: Kirkwood North – Looking at Point of take with Pigburn flowing away from viewer to upper middle of photo



Photo 8.3: Kirkwood North – Meter on race

Appendix C: Instream Ecology Assessment

Assessment of Effects on Instream Ecology due to Water Takes from the Pig Burn

Assessment undertaken by Matt Hickey

Water Resource Management Ltd

January 2020



Prepared for the Pig Burn Water Users Group

January 2020

by Matt Hickey



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Executive Summary

The Pig Burn is a small tributary of the Taieri River entering on the true right upstream of the Waipiata minimum flow site.

Presently there are 8 takes from the Pig Burn, the Pig Burn Water User Group (PBWUG) propose shifting and amalgamating 3 of these takes during low flows (< than 70 l/s at the Hamilton Runs Ford). Redistributing these three intakes during low flows will reduce the maximum instantaneous rate of take for the Pig Burn from 454.8 l/s to 332.6 l/s (moderate to high flows) and 262.6 (at lower flows).

The Pig Burn proposal represents significant hydrological alteration in the natural flow regime; however, the proposal is a significant improvement on the existing flow regime and resultant ecological effects. It is expected that the flow regime will mimic the natural pattern of gains and losses along the Pig Burn.

Brown trout and longfin eel have been recorded throughout the section of the Pig Burn affected by takes. The PBWUG proposal prevents any dewatering of the perennial reaches of the Pig Burn maintaining a continuous flow along the reaches that would not naturally dry.

Redistribution of the takes mean that habitat fragmentation is confined to naturally drying reaches and the length and duration of historic drying is reduced. The gaining reach between the Hamilton Runs Ford and Patearoa Waipiata Bridge is significantly improved for ecological values.

The PBWUG proposal provides significant levels of habitat protection in the neutral and gaining reaches, acknowledging that the losing reaches naturally dry.

Scope

The scope of this report is to provide an assessment of hydrology and aquatic ecology of the Pig Burn under PBWUG's proposed take reconfiguration and residual flow proposal. The hydrology of Harpers Creek is also discussed briefly.

Available Information

This assessment relies heavily on the following pieces of information:

1. Flow records collected by Otago Regional Council (ORC) at the Pig Burn Gorge Flow Sites
2. Longitudinal flow gaugings carried out by ORC.
3. Fisheries information from the NIWA Freshwater Fish Database.
4. Observation from the PBWUG.
5. Water metering data.
6. Habitat analysis

Introduction

The Pig Burn Water Users Group (PBWUG) is looking to apply to replace existing water take consents from the Pig Burn. The proposal includes a significant reduction in both rates of take and the amount of water consented and a change in the take locations during low flows. Residual flows are also recommended where flows are perennial.

Currently there are eight water takes from the Pig Burn catchment these are outlined in Table 1.

Table 1. Consents from the Pig Burn Catchment covered in this assessment listed from most upstream to downstream.

Consent Number	Consent Holder	Existing Maximum Rate of Take (l/s)	Proposed Maximum Rate of take during high flows (l/s)	Proposed Maximum Rate of take during low flows (l/s)
2000.136 / 2000.244	Cleugh/McDonald/ Smith	86	56	56
2002.010	Bradfield's	7	7	7
96394	Herlihy at the Gorge	42	42	42
97210	Weirs	55.6	55.6	55.6
96230	Herlihy's at the Ford	111	70	60
97128	Kirkwood South	55.6	60	
2000.498	Mulholland	55.6		
96254	Kirkwood North	42	42	42
Total Combined Maximum Rate of Take		454.8	332.6	262.6

This report outlines the unique hydrology of the Pig Burn, the existing and natural flow regime and the changes proposed by the PBWUG. Following this is an assessment of effects on the aquatic values of the Pig Burn is provided. Harpers Creek is also briefly discussed below.

Harpers Creek

Harpers Creek is a naturally ephemeral creek that drains the northern end of the Rock and Pillars. Water under consent 2001.136 is taken from the upper Pig Burn and discharged to Harpers Creek for later use downstream (Figure 1).

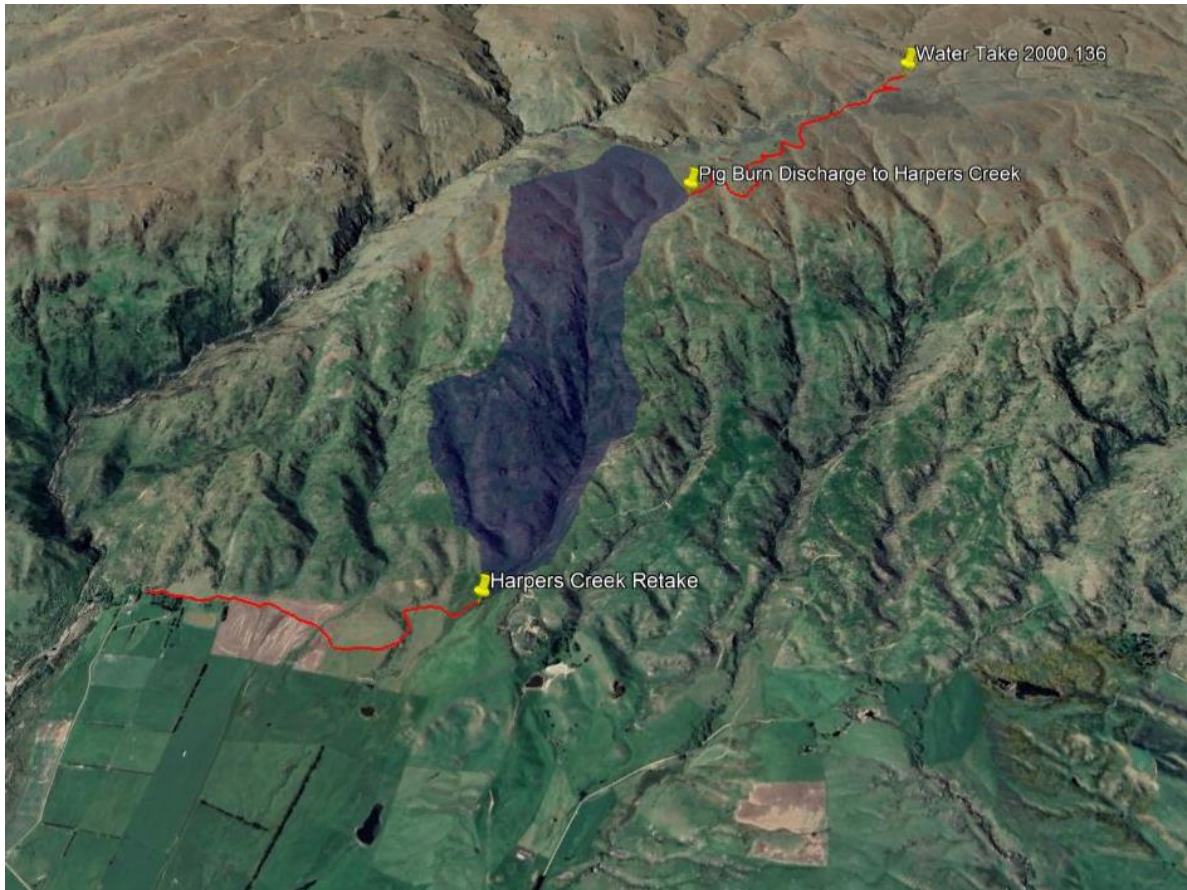


Figure 1. Map showing the take from the Pig Burn and the race that takes water to Harpers Creek. Also shown is the race from Harpers Creek the water users use to irrigate from. The 2Km² catchment area between the discharge and retake is shown (shaded blue).

Without the introduction of Pig Burn water Harpers Creek would likely only flow during wetter winter months or following rainfall events. As a result, no residual flow condition is considered necessary for this abstraction.

Pig Burn Hydrology.

The Pig Burn has one continuous flow site at the gorge above the majority of abstractions that operates during the peak of summer (Figure 2).

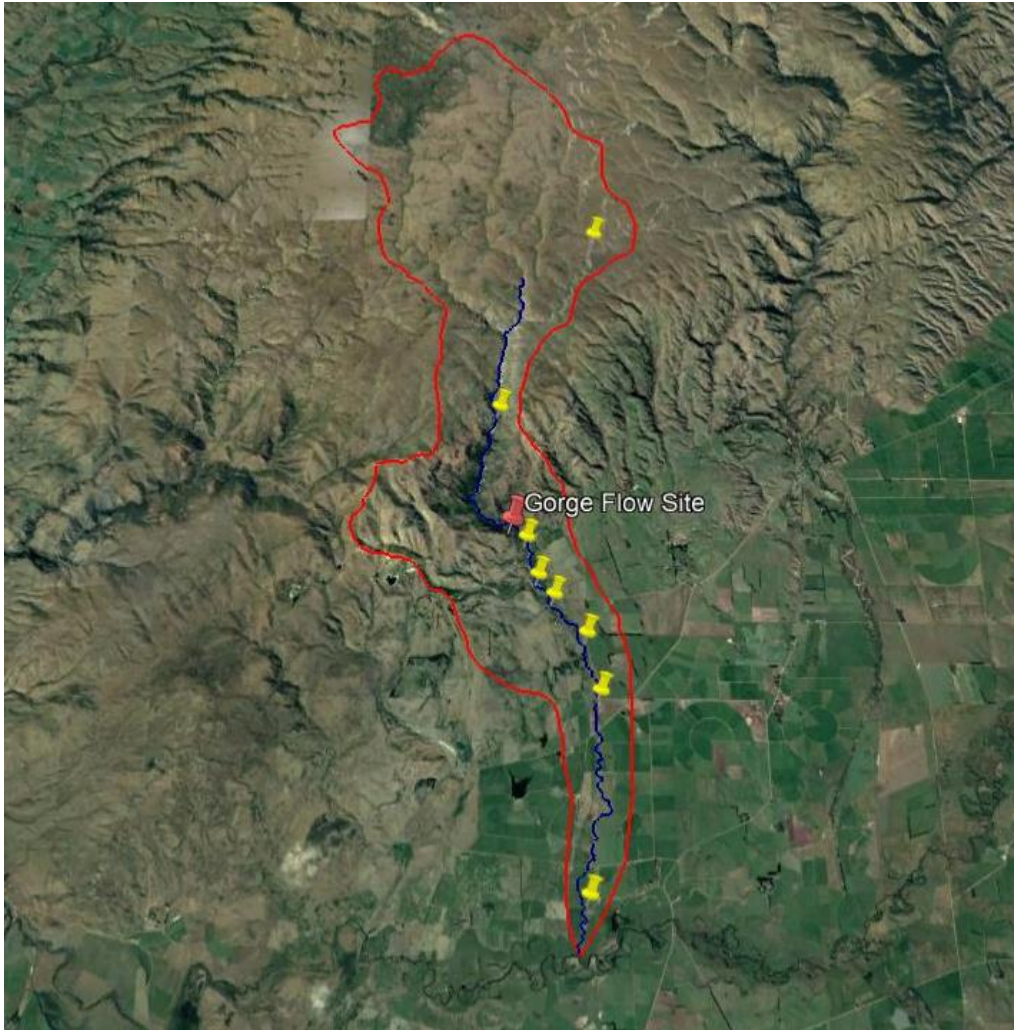


Figure 2. Map showing the Gorge Flow Site (red pin) and the existing take locations (yellow pins) from the Pig Burn Catchment. Corresponding take details are listed top to bottom in Table 1 above.

The two takes upstream of the Gorge Flow Site (Figure 2) take very little water during summer low flows (<5 l/s combined based on metering) and water that is taken during low flows is for domestic and stock water use.

The following flow statistics for the Pig Burn at the Gorge show that summer low flows can be as low as 31 l/s and are often less than 50 l/s in the Pig Burn upstream of the majority of takes.

Table 2. Observed flow statistics based on daily average flows for the Pig Burn at the Gorge during the irrigation season (Oct-April).

Season	Minimum (l/s)	Median (l/s)	Mean (l/s)	7-day ALF (l/s)
2010/11	69	316	355	76
2014/15	34	133	260	35
2016/17	66	242	350	74
2017/18	31	170	304	33
2018/19	42	244	412	46
Average	48	221	336	53

Pig Burn Downstream of the Gorge Flow Site

The majority of the abstraction and all the known gaining and losing reaches of the Pig Burn occur downstream of the Gorge Flow Site.

Hydrological investigations have shown that the Pig Burn downstream of the Gorge Flow Site has significant losing and gaining reaches (Figure 3). During times of low flow losses to groundwater in the upper losing reach (above Hamilton’s Runs Ford) have been identified as ~90 l/s¹. Losses to groundwater from the lower losing reach (Downstream of the Patearoa Waipiata Road) have been estimated to be at least 30 l/s¹.

¹ Based on measured inflows and take data compared to observations made by the Pig Burn Water Users Group in Pig Burn Report on the monitoring of the flows and abstractions in the Pig Burn by the Pig burn Water Users Group during the last three seasons, namely 2015/16, 2016/17, 2017/18.

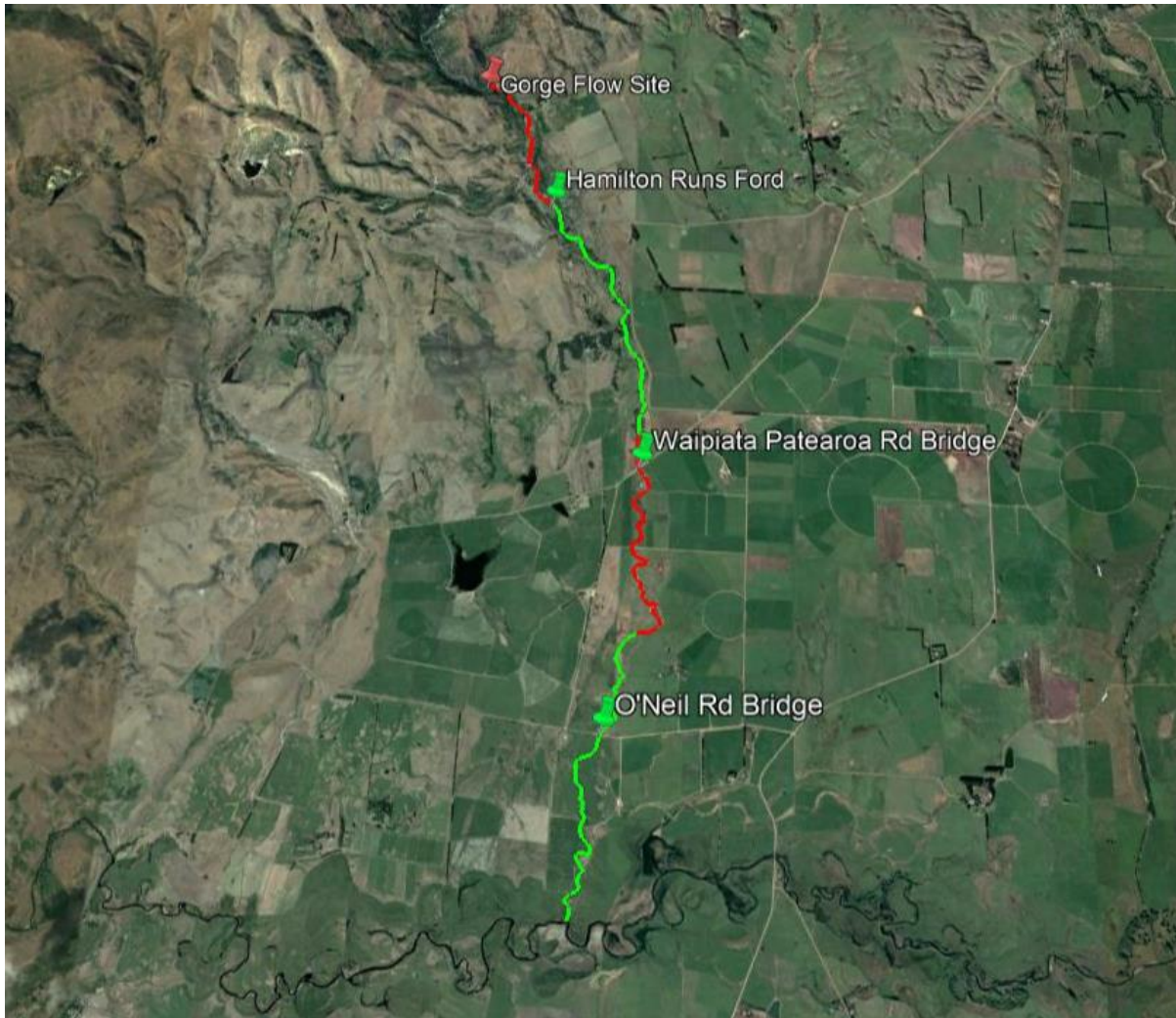


Figure 3. Known losing (shown in red) and gaining/neutral (shown in green) reaches in the Pig Burn downstream of the Gorge Flow Site (red pin). Road Crossing are shown (green pins)

These losses to ground mean that the Pig Burn between the Gorge Flow Site and the Hamilton Runs Ford is naturally intermittent. Losses to groundwater in the upper losing reach have been assessed to reemerge downstream of the Hamilton Runs Ford in a gaining reach (Figure 3).

It should be acknowledged that there appears to be significant variation in losses based on the flow and take data coupled with the observation data, especially in the lower losing reach (between the Patearoa Waipiata Rd and O'Neil Rd), meaning that drying may or may not be an annual event naturally. Because flows reappear in the lower reaches of the Pig Burn it has been assumed losses aren't lost completely from the system.

The loss estimates in the longitudinal flow graphs below have been tied to the flow occurring at the time when the Pig Burn was observed dry (Appendix 1), this means that they are likely to be a

conservative estimate of loss. As a result, it is likely that the flows needed to maintain surface connection throughout the Pig Burn are likely higher than presented and higher than the natural low flow, especially during the peak of summer if corresponding groundwater levels are low.

Longitudinal flows for the Pig Burn downstream of the Gorge Flow Site

Natural longitudinal flow profiles for the Pig Burn downstream of the Gorge Flow Site have been provided based on the observed gains and losses outlined in Appendix 1.

Figure 4 provides a longitudinal flow profile for an inflow of 53 l/s as this is the recorded 7-day MALF for the Pig Burn Gorge Flow Site based on five complete summers of data.

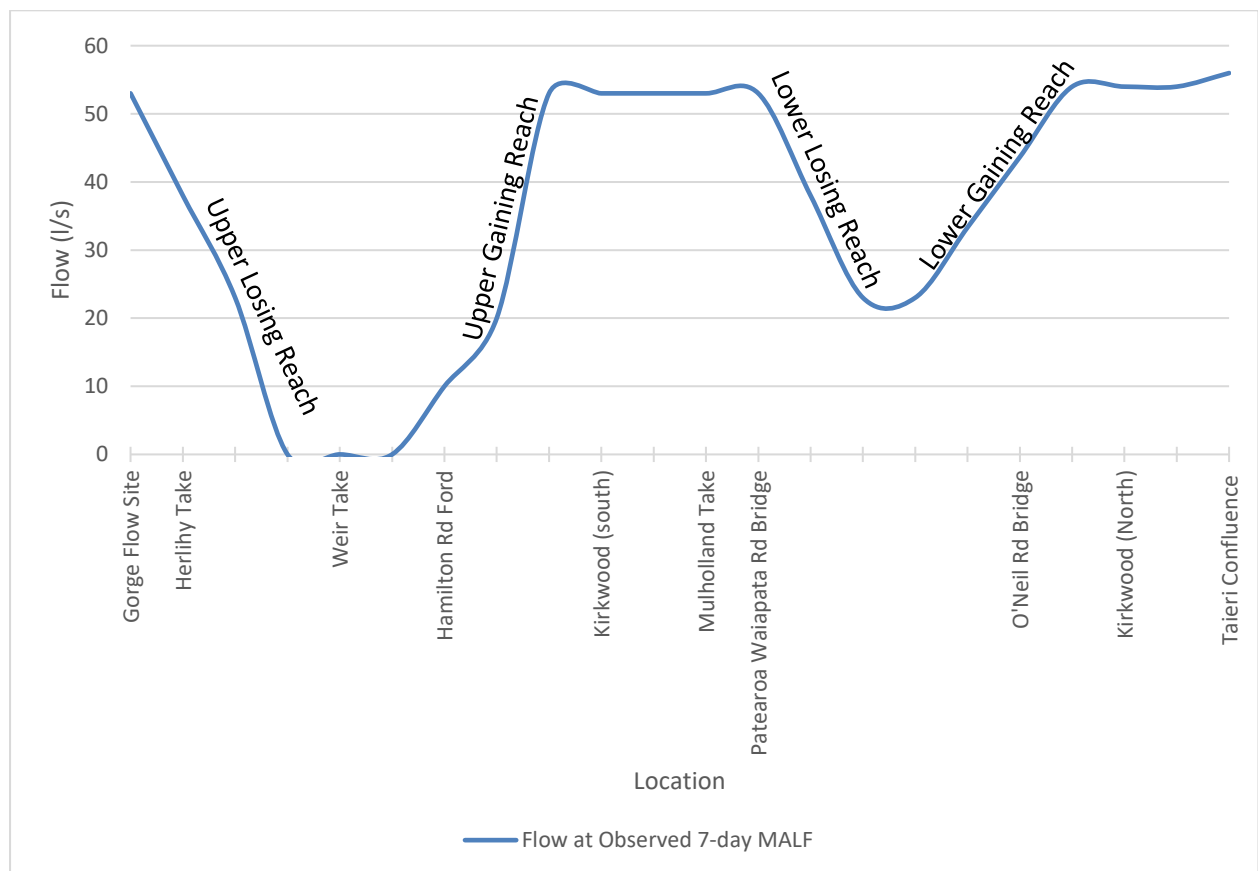


Figure 4. Longitudinal flows for the lower Pig Burn for an inflow of 53 l/s (observed 7-day MALF). Also shown is the gaining and losing reaches. It is ~3Km of stream length between the Hamilton Rd Ford and the Patearoa Waipata Rd Bridge.

In January 2018 daily average flow recorded at the Pig Burn Gorge Flow Site fell to 30 l/s and the 7-day MALF for the 2017/18 irrigation season was 33 l/s. Figure 5 below provides a comparison of these in-flows to the 7-Day MALF of 53 l/s.

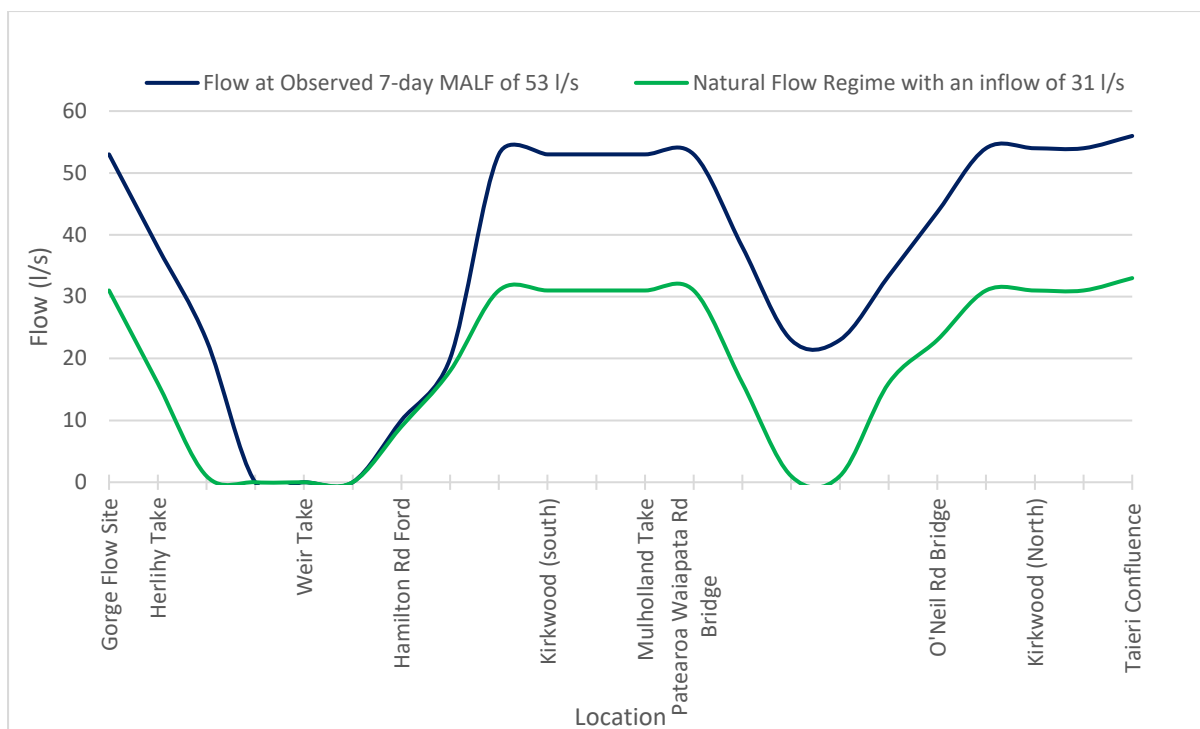


Figure 5. Longitudinal flows for the lower Pig Burn for an inflow of 53 l/s (observed 7-day MALF) and the lowest daily inflows of 31 l/s in January 2018. It is ~3Km of stream length between the Hamilton Rd Ford and the Patearoa Waipata Rd Bridge.

Figure 5 shows that in dry seasons the Pig Burn is likely to dry in both the upper and lower losing reaches naturally. Based on the observations of the water users it can also be seen that the gains in the lower Pig Burn can vary greatly. It is suspected that as groundwater levels from the surrounding plain drop as summer progresses the gains in the lower Pig Burn drop back also.

Natural Vs Observed Low Flow – 17/01/2018

Figure 6 below provides a direct comparison of the flows that were observed throughout the Pig Burn on the 17/01/2018 compared to what would have occurred with no abstraction.

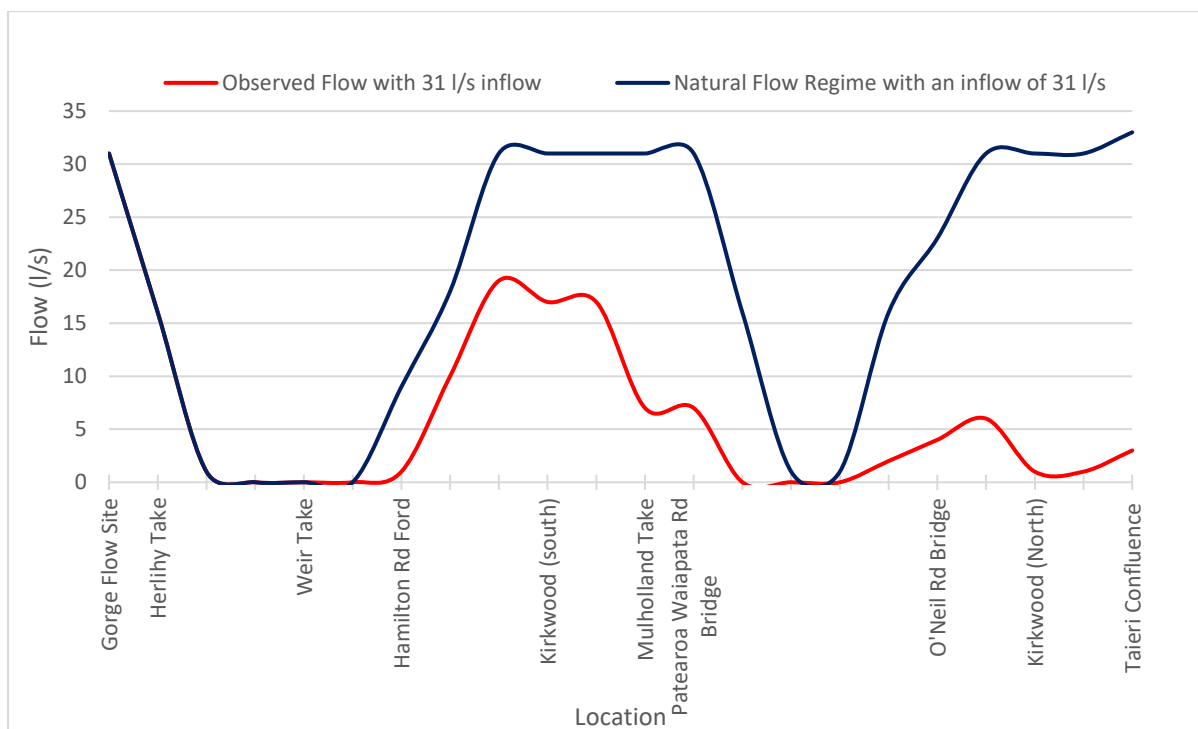


Figure 6. Observed flow regime with existing abstraction compared to the natural flow regime with an inflow of 31 l/s for the 17/01/2018. It is ~3Km of stream length between the Hamilton Rd Ford and the Patearoa Waipata Rd Bridge.

Figure 6 shows that with the influence of abstraction the reaches that would naturally have very low flows or be dry are extended, most notably in the Lower Losing reach below the Patearoa Waipata Rd Bridge. It should be noted that on the 17/01/2018 that only 4 l/s was being taken from the upper losing reach as this reach was dry naturally. All other takes were only taking a small portion of their consented rate due to lack of supply.

Pig Burn Fish.

Schedule 1A² lists the significant presence of trout in the Pig Burn. Only brown trout and longfin eel have been recorded in the Pig Burn based on the NIWA Freshwater Fish Database. A recent ORC water quality and ecosystem health report for the Upper Taieri³ had two sampling locations in the Pig Burn (near the Taieri confluence and near the Gorge Flow Site) and that found good number of juvenile

² Schedule 1A of the Regional Plan: Water.

³ Kitto, J. 2012. Water quality and ecosystem health in the Upper Taieri. ISBN 978-0-478-37651-7.

brown trout, but no indigenous species. Figure 7 provides a map of fish records for the Pig Burn Catchment⁴.

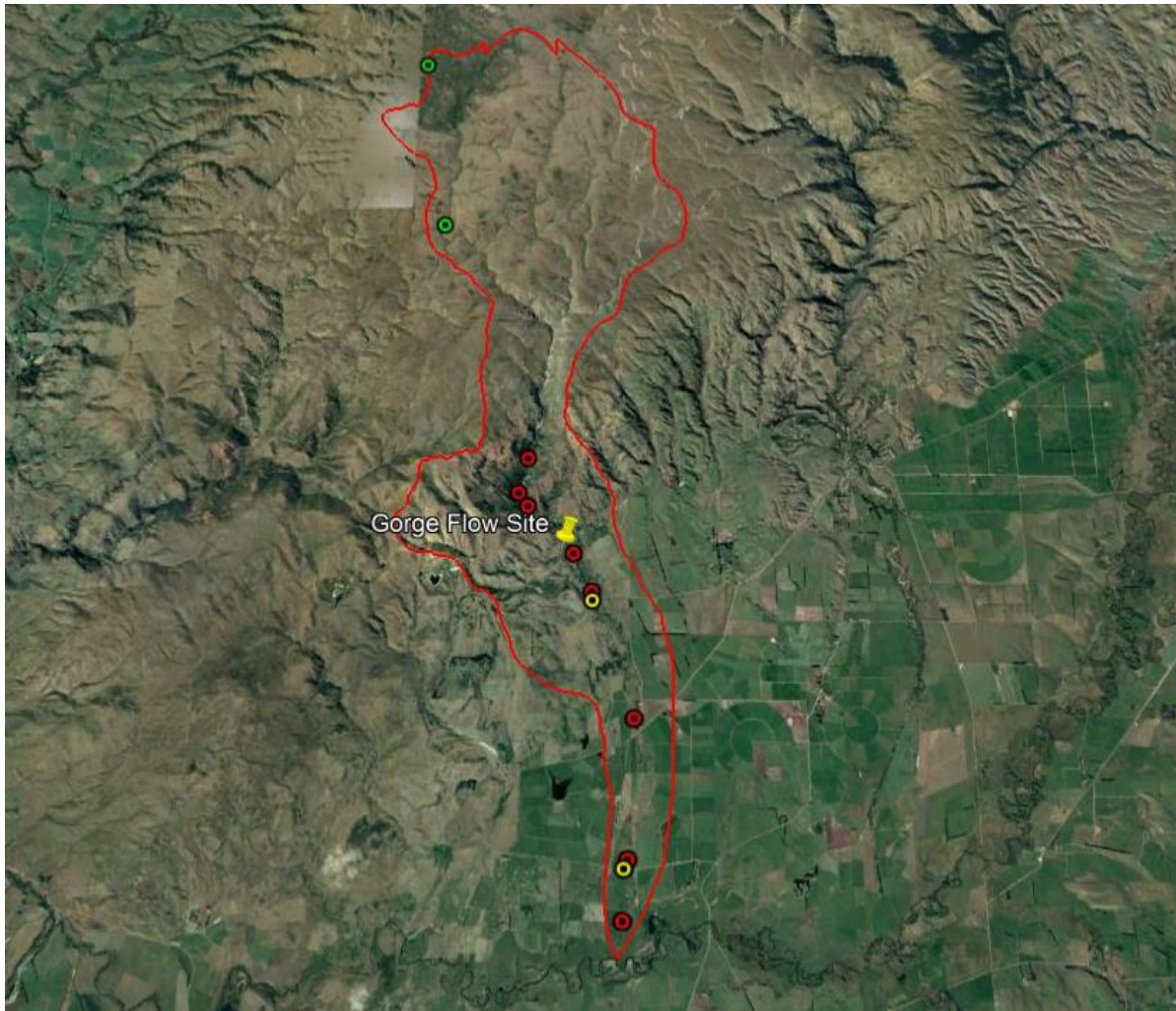


Figure 7. Fish distribution in the Pig Burn Catchment, brown trout (red), longfin eel (yellow) and no species (green). Also shown is the Gorge Flow Site (yellow pin).

PBWUG Proposal.

The hydrological information indicates that there is significant variation in flows naturally downstream of the Gorge Flow Site due to losses and gains from groundwater. It is likely that ecologically the gaining reaches are of the highest value for fish and invertebrates.

Both the Herlihy Gorge Take and the Weir Take are naturally curtailed during times of low flow due to the losing reach going dry. It is proposed that these two takes remain as they are.

⁴ Records are taken from the NIWA FWFDB and Kitto. J. 2012. Water quality and ecosystem health in the Upper Taieri. ISBN 978-0-478-37651-7.

Currently the gaining reach in the Pig Burn between the Hamilton Runs Ford and the Patearoa Waipiata Rd Bridge is changed from perennial to intermittent due to abstraction by the three takes within it. It is proposed that while flows are high the Herlihy Ford Take should operate as normal while leaving a residual flow of 70 l/s past their intake.

It is proposed that the Kirkwood South and Mulholland takes combine at a new point between their existing take locations. Further to this it is envisaged once flows fall to 70 l/s at the Hamilton Runs Ford that the Herlihy Take also abstracts from the new combined take location. Water from the combined take will be shared between the three users. It is expected that there will be a residual flow of at least 10 l/s below the combined take at all times.

The most downstream take on the Pig Burn, Kirkwood North will remain in place with a residual flow of 10 l/s.

Figure 8 below attempts to show the proposed change in take points and when they would operate in the Pig Burn compared to the existing take setup.

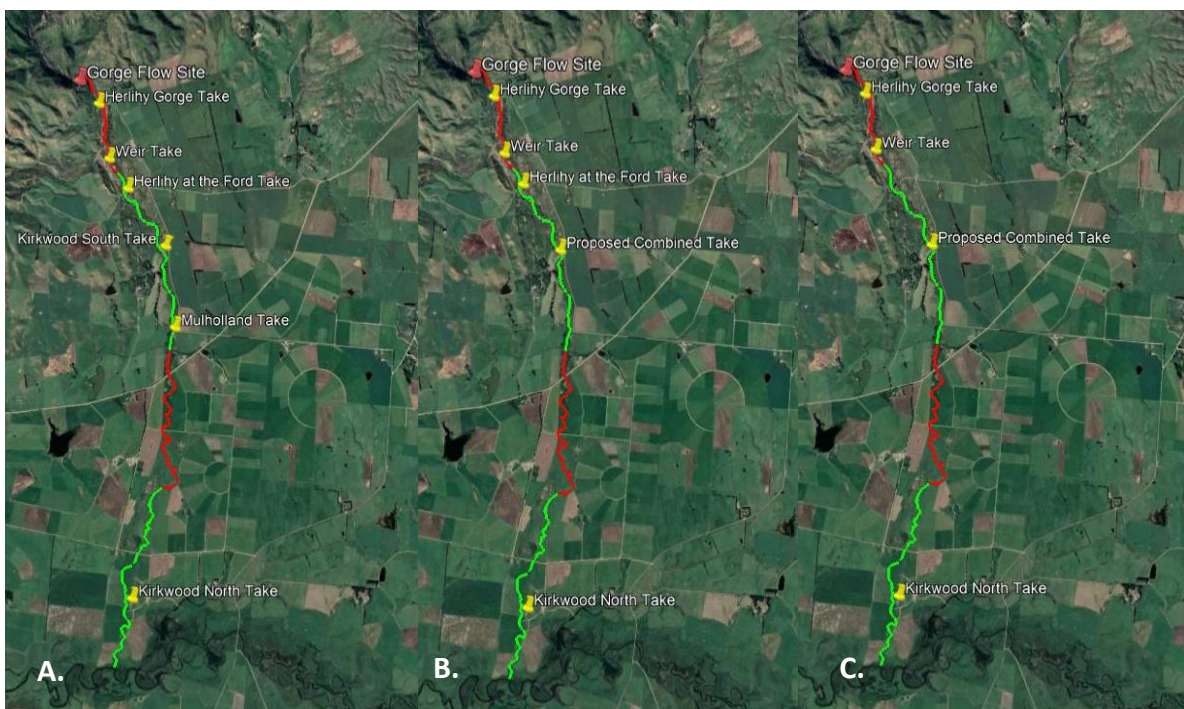


Figure 8. A. Existing Take locations (operates at all flows) compared to proposed take locations during B. higher flows (>70 l/s at the Hamilton Runs Ford) and C. low flows (<70 l/s at the Hamilton Runs Ford). Losing reaches (red) and gaining/neutral reaches (green) are shown.

Fish Habitat

Habitat analysis has been completed on the Pig Burn, however, due to the variability in surface flows longitudinally along the Pig Burn, application of it is very difficult. This is because the common reference to benchmark habitat analysis is the 7-day MALF⁵. For example, at any given point along the Pig Burn the natural 7-day MALF can range from 0 l/s to 53 l/s (Figure 4). Because of this difficulty in varying flows, longitudinal flows based on the status quo are provided against the regime proposed by the PBWUG in this application (Figure 9 and Figure 10).

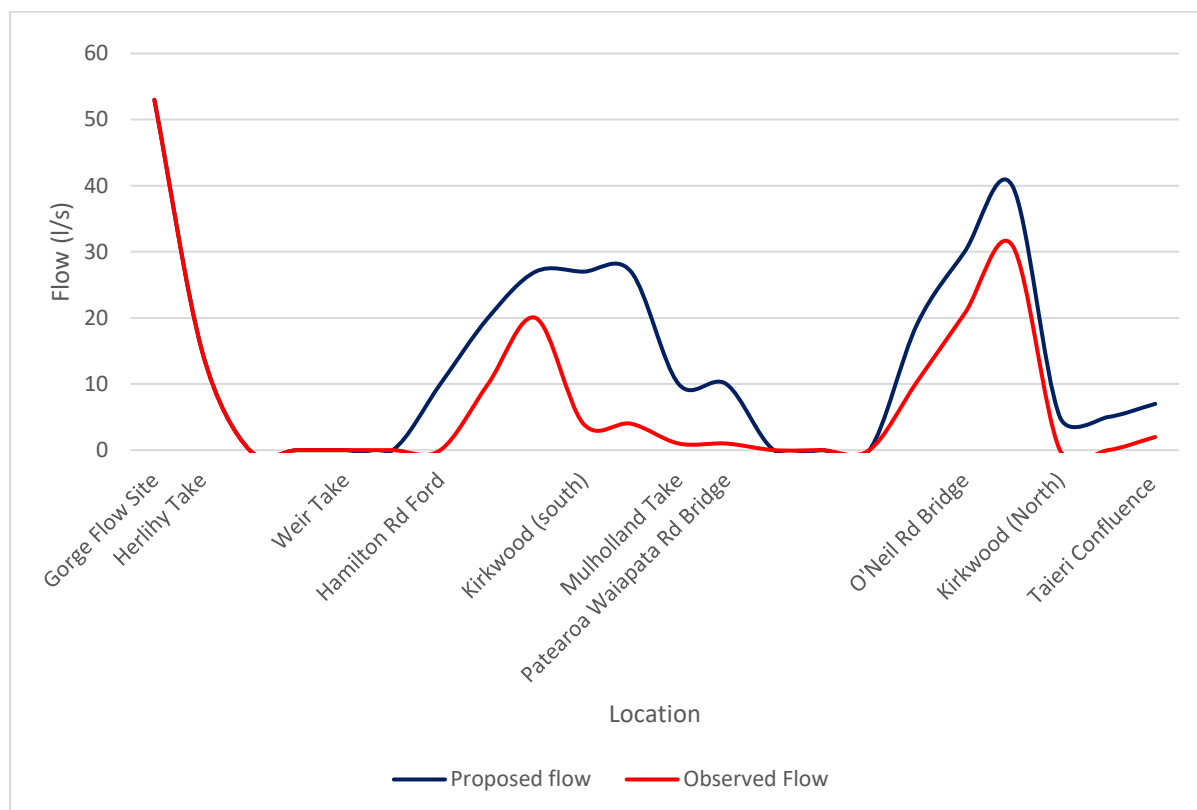


Figure 9. Longitudinal flows for inflows the equivalent of the observed 7-day MALF of 53 l/s at the Gorge Flow Site. Proposed Flows are those expected based on the PBWUG proposal outlined in Section 7 above and Observed Flows are those seen in the Pig Burn under an inflow of 53 l/s. It is ~3Km of stream length between the Hamilton Rd Ford and the Patearoa Waiapata Rd Bridge.

⁵ This could be either the natural or observed 7-day MALF depending on the values being assessed.

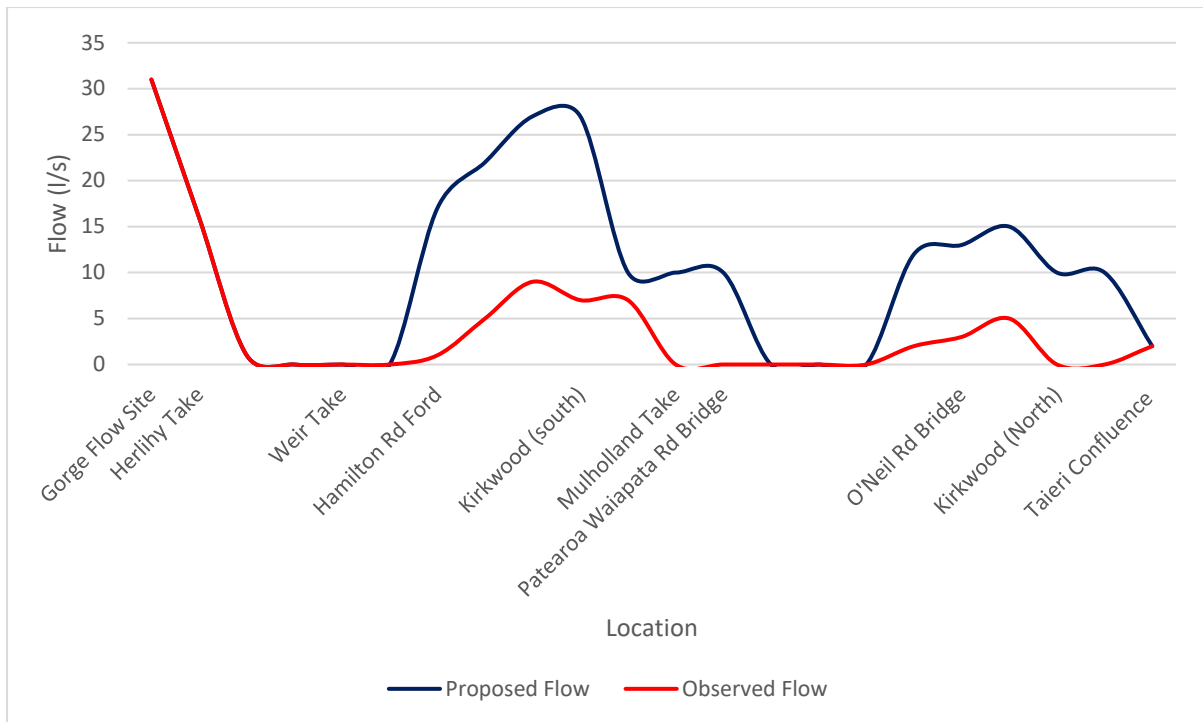


Figure 10. Longitudinal flows for inflows of 31 l/s at the Gorge Flow Site. Proposed Flows are those expected based on the PBWUG proposal outlined in Section 7 above and Observed Flows are those seen in the Pig Burn under an inflow of 31 l/s on the 17th of January 2018. It is ~3Km of stream length between the Hamilton Rd Ford and the Patearoa Waipata Rd Bridge.

Simply the difference between the red and blue lines in Figure 9 and Figure 10 above can be interpreted as gains in habitat for fish and invertebrates at times of low flow.

Residual Flows

- The Cleugh, MacDonald and Smith Take - No residual flow is proposed as it naturally dries at the intake each summer.
- Bradfield's Take - No residual flow is proposed as the take is small (<7 l/s) relatively to the size of the Pig Burn with the lowest daily average flow recorded downstream of the take of 31 l/s.
- Herlihy at the Gorge Take- No residual flows are recommended as natural losses in this reach restrict the taking during low flows naturally.
- Weir Take - No residual flows are recommended as natural losses in this reach restrict the taking during low flows naturally.
- Herlihy at the Ford Take - A residual flow of 70 l/s is proposed. It is expected that this residual flow will ensure the gaining reach from the Hamilton Runs Ford to the new combined take will flow continuously providing improved habitat for juvenile brown trout and longfin eel compared to what occurs under the status quo.

- Higher Flows Combined Take (Kirkwood South and Mulholland) – A residual flow of 10 l/s is proposed. By capping the rate of take at 60 l/s in combination with the Herlihy Ford Take Residual flow of 70 l/s any gains between the Herlihy Ford Take and Combined Take will be left instream. It is expected that these residual flows in combination will reduce the extent and duration of drying in the lower losing reach and improve habitat for juvenile brown trout and longfin eel compared to what occurs under the status quo. By leaving a residual flow it is also expected that the rate of drying in the lower losing reach will be reduced providing the opportunity for fish to move into the perennial reaches.
- Low Flows Combined Take (Herlihy, Kirkwood South and Mulholland) – A residual flow of 10 l/s is proposed. It is expected that this residual flow in combination with the maximum rate of take being capped at 60 l/s will reduce the extent and duration of drying in the lower losing reach. It is also expected that the rate of drying in the lower losing reach will be reduced providing the opportunity for fish to move into the perennial reaches. Any gains from groundwater that occur below the Combined Take will contribute to the 10 l/s residual at the point of take.
- Kirkwood North Take - A residual flow of 10 l/s is recommended. It is expected that this residual flow will ensure the lower gaining reach from O’Neil Road to the Taieri confluence will flow continuously providing improved habitat for juvenile brown trout and longfin eel compared to what occurs under the status quo.

Conclusion.

The PBWUG monitoring has identified two significant natural losing reaches, one that is annually dry naturally (the upper losing reach) and the other potentially dries annually (lower losing reach). Observations indicate that losses in the lower losing reach varies significantly and that surrounding groundwater levels likely influence loss rates greatly.

Monitoring has identified two gaining reaches that are perennial naturally. It has been identified that the upper gaining reach under the existing take regime becomes fragmented and intermittent.

Fisheries assessments show that brown trout are throughout the Pig Burn from upstream of the Gorge flow Site to the Taieri confluence. Longfin eel are the only indigenous fish that have been found in the Pig Burn. It is likely that the perennial reaches of the Pig Burn are of the highest ecological value for fish.

Currently the majority of takes in the Pig Burn have no residual flow conditions. The PBWUG have developed a proposal where all takes that operate during low flows from perennial reaches will have residual flow conditions. The exception being the Bradfield Take as it is very small (<7 l/s) compared to the size of the Pig Burn at the take point (>31 l/s).

Further to this the PBWUG proposes to amalgamate 2 takes during times of moderate flows and to amalgamate 3 takes and shift the combined take point downstream during times of low flow to ensure higher flows remain in the upper gaining reach preventing dewatering.

Applying a residual flow on the amalgamated take will mean that disconnection in the lower losing reach will both be reduced in extent and duration compared to what has occurred historically. Once flows emerge in the lower gaining reach, they will be maintained to the confluence via a residual flow on the Kirkwood North Take.

It is expected that the proposal will provide significant improvement to fish and invertebrate habitat relative to the existing flow regime in the Pig Burn, while maintaining a flow pattern comparable to what would occur naturally with no abstraction.

Appendix 1. Hydrology Patterns of the Pig Burn

Flow data for the Pig Burn at the Gorge, water metering data for the takes, and physical observations of flows by the Pig Burn water users have been assessed to try to determine both the natural and observed flow pattern in the Pig Burn from the gorge to its confluence with the Taieri River. The observations have meant the following gain and loss estimates have been made along the Pig Burn (Table 3).

Table 3. Description of the different hydrological reaches of the Pig Burn.

Reach description	Estimated flow gain or loss	Rationale for gains and losses
Upper Neutral Reach from the Pig Burn Gorge upstream	Neutral reach, no significant gains or losses.	The upper Pig Burn is in a confined gorge and the landholders are unaware of any obvious gaining or losing sections.
Upper losing reach Gorge down to Hamilton Rd Ford	90 l/s loss.	Observed dry below Weirs Take on the 04/01/2017. In-flows were 160 l/s and total take was 79 l/s. Flow required to maintain surface connection was therefore greater than 81 l/s.
Upper gaining reach from Hamilton Rd Ford to Kirkwood's South Take.	Assume all water lost (excluding water taken) in the upper losing reach returns in this section.	The difference between flow recorded at the gorge and the combined abstraction from Herlihy at the Gorge and Weirs take.
Mid neutral reach from Kirkwood's South Take to Patearoa Waipiata Bridge	Neutral reach, no significant gains or losses.	Doesn't appear to lose or gain water compared to the other losing and gaining reaches.
Lower losing reach from Patearoa Waipiata Bridge to 500 upstream of O'Neil Rd Bridge.	30 l/s loss	Observed dry 600m below the Patearoa Waipiata Rd Bridge on the 04/01/2017 and the 18/01/2017 ⁶ . Based on inflows at the Gorge Flow Site and recorded takes there was 23 -29 l/s expected at the Bridge on these days respectively. Flow required to maintain surface connection was therefore greater than 29 l/s.
Lower Gaining reach 500m upstream Of O'Neil Rd Bridge to Kirkwood's North take	Gaining reach with a range of 5 – 35 l/s.	Observed that the Pig Burn was Dry upstream of the Kirkwood North Take on the 04/01/2017 but the take was getting 34 l/s. No flow was observed below the take. Therefore, the gain was 34 l/s. Gains vary greatly in this reach depending on time of the season.
Lower neutral Reach from Kirkwood's North Take to Taieri Confluence	Small gain observed near the confluence, but these are so small it's effectively a neutral reach. A small 2 l/s gain is modelled.	Observations suggest a small gain below the Kirkwood North Take towards the confluence.

⁶Pig Burn Report on the monitoring of the flows and abstractions in the Pig Burn by the Pig burn Water Users Group during the last three seasons, namely 2015/16, 2016/17, 2017/18. Provided by the Pig Burn Water Users Group.

PIGBURN CREEK

Report on the monitoring of the flows and abstractions in the Pigburn Creek by the Pigburn Water Users Group during the last three seasons, namely 2015/16, 2016/17, 2017/18



May 2018

Background:

The Pigburn Water Users group (PWUG) was formed in February 2016 with the objective of the current abstractors to work as a group towards replacing current permits as required by 2021

From an environmental perspective it is generally agreed that the pivotal abstractions are those on the Pigburn flood plain, the creek area from where the creek emerges from the Rock and Pillar gorge to the confluence of the Pigburn and Taieri River, a length of approximately 7.5 Kilometres. Thus, this report deals only within the flood plain.

Data Collected:

- a) On specific dates the sections of the creek that had no visible surface water were recorded.
- b) On those same dates the volumes of abstractions at the six abstraction points were recorded.
- c) Flow upstream of the Herlihy gorge take was recorded by the Otago Regional Council.

2015/16 - One recording on 23/02/2016

2016/17 - six recordings on a fortnightly period Nov 9th – Jan 18th
(persistent rains from late January cancelled further observations)

2017/18 - again six recordings on a fortnightly basis Nov 8th – Jan 17th
(a record rain on 31st Jan ended all observations and abstractions)

Brief Commentary on the Seasons:

2015/16 A dry (normal) season with meaningful rain till may

2016/17 Was abnormally wet with unseasonal summer/autumn rains

2017/18 A potentially very dry season (Dec/Jan), broken by record late summer/autumn rains

Modus Operandi:

The responsibility for recording and observing the Pigburn was divided between the four abstractors. The assimilation of the four data sets was completed by Megan Linton BAppSc Environmental Management.

Summary of Observations:

1. The Pigburn Creek exhibits a unique ephemeral behaviour with the natural flow repeatedly drying up only to reappear downstream.
2. Generally, the natural flow in the Creek is sufficient to meet both environmental and farmer interests (social and economic) until mid-December. When the snow drifts in the Rock and Pillar headwaters are expended, the flow in the creek collapses over a very short period. For example, refer to the creek observations of 6th and 20th December 2017 which exhibits how the water available for both abstractions and environmental requirements change rapidly as the natural creek flow collapses.
3. When the creek is exhibiting normal behaviour 'typical year' from early January there is usually insufficient natural flow to deliver to either environmental or farmers irrigation needs.
4. By late January the environmental values of a significant length of the Pigburn floodplain has been destroyed with the creek bed going dry. For example, refer to the recorded abstractions and the dry creek bed observations in January 2016 and January 2018.
5. The prime reason for the creek going dry is due to the minimal flow that 'mother nature' delivers from the catchment, not because of farmer abstractions. For example, at the ORC recording site there was but 43 l/sec on the 3rd January and reducing to 31 l/sec on the 17th January. Farmer abstractions in January 2018 were inconsequential.
6. Farmer abstractions during the period where the environmental values of the Pigburn are seriously degraded for a period that can extend from early January to late May are miniscule (see observations 23/02/2017 and 17/01/18)
7. Ceasing farmer abstractions during this period would deliver no environmental gain. The flow at any single abstraction site would just disappear into the creek bed gravels.
8. There is a period when the creek is collapsing that environmental and farmer interests are in direct conflict. This period can be as short as two weeks. For example, the observations on the 6th and 20th of December 2017.
9. If farmer abstractions were reduced or even ceased during that narrow time frame when the diametrically opposed interests are in conflict, such action would not avert the environmental damage (trout and other biota) that is subsequently suffered by the natural flow in the creek resulting in extensive lengths of dry creek bed.

Further Observations:

ORC Flow Data (gorge monitoring site)

The flow data measured at the gorge monitoring site is not an accurate predictor as to flows downstream.

For example, on the 17th January 2018 a flow of 31 l/sec was recorded at the ORC's installed flow gauging site. However, some 300 metres downstream the creek bed was dry for some 500 metres. This was in spite of there being no abstraction at the Herlihy gorge intake some 100 metres downstream and no surface water at the Weir intake (approximately 400 metres downstream from the gorge monitoring site) available for abstraction.

Stranded Fish

It is of significance that without exception the four abstractions involved in the monitoring have observed very few stranded fish in the residual pools left as the creek dries up. Such an observation is in direct contrast with that observed in the neighbouring Sowburn Creek where fish stranding's are a common occurrence.

It is suggested that independent, professional fish monitoring could be done in late December 2018 or early 2019 to evaluate the quantum of fish that are put at risk as the continuous flow in the creek ceases as the natural flow drops.

PIGBURN CREEK

Abstraction Intakes & Permit Numbers



2015/16 Season:

The 2015/16 season was one of the drier seasons in the last decade, snow melt occurred earlier than normal and the dry continued through the late summer and autumn period. A substantial rainfall event occurred on the 20th May 2016 resulting in mother nature providing sufficient water for continuous flow of the creek. An example of the season's extreme dry period was the creek bed some 300m downstream of the Herlihy gorge take was observed to be dry from the 10th of December 2015 through till the 20th of May 2016.

As an initial monitoring exercise to obtain data and abstractions and to measure and record the areas of the creek that had no visible surface water. A 'snap shot' of the Pigburn was completed on 23rd February 2016.

The results are summarised as:

Abstraction Location	Flow l/sec
Herlihy Gorge (96394)	0
Weir (97210)	20
Herlihy Ford (96230.V1)	1
Kirkwood South (97128)	1
Mulholland (2000.498)	13
Kirkwood North (96254)	9

The observations made on 23rd February 2016 were that approximately 65% of the Pigburn creek bed from the gorge to the confluence with the Taieri River had no visible surface water (See attached Map.1)



Image 1: Downstream Herlihy Ford Take



Image 2: 500m Downstream Patearoa – Waipiata Rd

Map 1. Pigburn Creek Observations 23rd February 2016



2016/2017 Season:

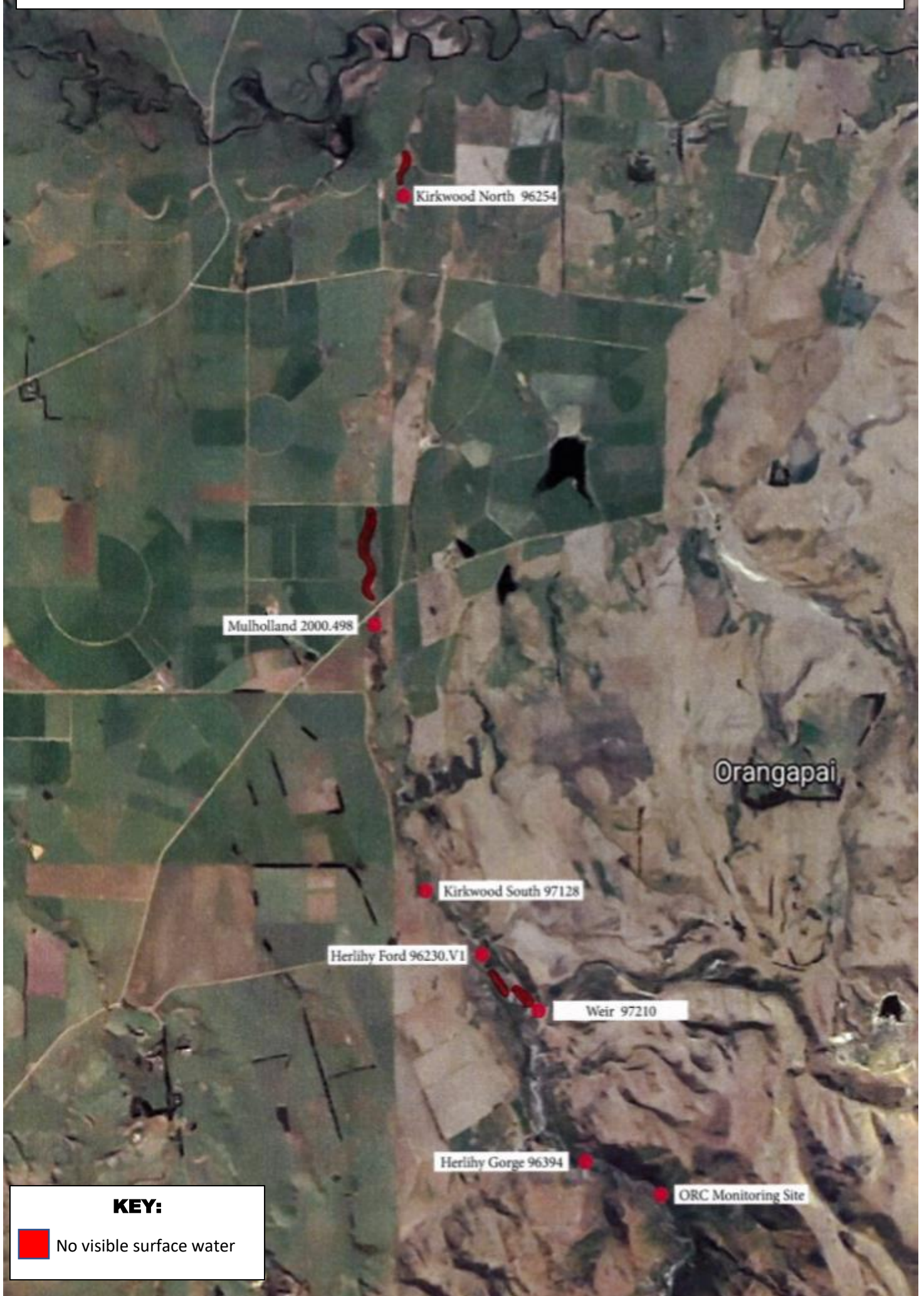
The 2016/2017 season generally saw above normal flows in the Pigburn creek for the majority of the irrigation season. Snow reserves dumped in the winter of 2016 saw ample water available for both agricultural and environmental requirements. The creek observed a continuous flow until mid-December. The discontinuous flow lasted for a short amount of time until significant rainfall in the last week of January occurred. From this time onwards record rainfall provided continuous flow in the Pigburn for the remainder of the 2016/2017 irrigation season negating the need to continue monitoring fortnightly as planned.

The results of the fortnightly monitoring are summarised below in l/sec:


Abstraction Location	Nov 9th	Nov 23rd	Dec 7th	Dec 21st	Jan 4th	Jan 18th
ORC Monitoring Site	647	874	463	140	160	100
Herlihy Gorge	43	35	45	38	54	18
Weir	20*	20*	35*	42	25	6
Herlihy Ford	10	15	49	40	19	6
Kirkwood South	12*	15*	45*	40*	20*	25*
Mulholland	16	13	9	39	19	11
Kirkwood North	25	38	79	40	34	3

** monitoring site was not operational during this period the results shown are visual estimates.*

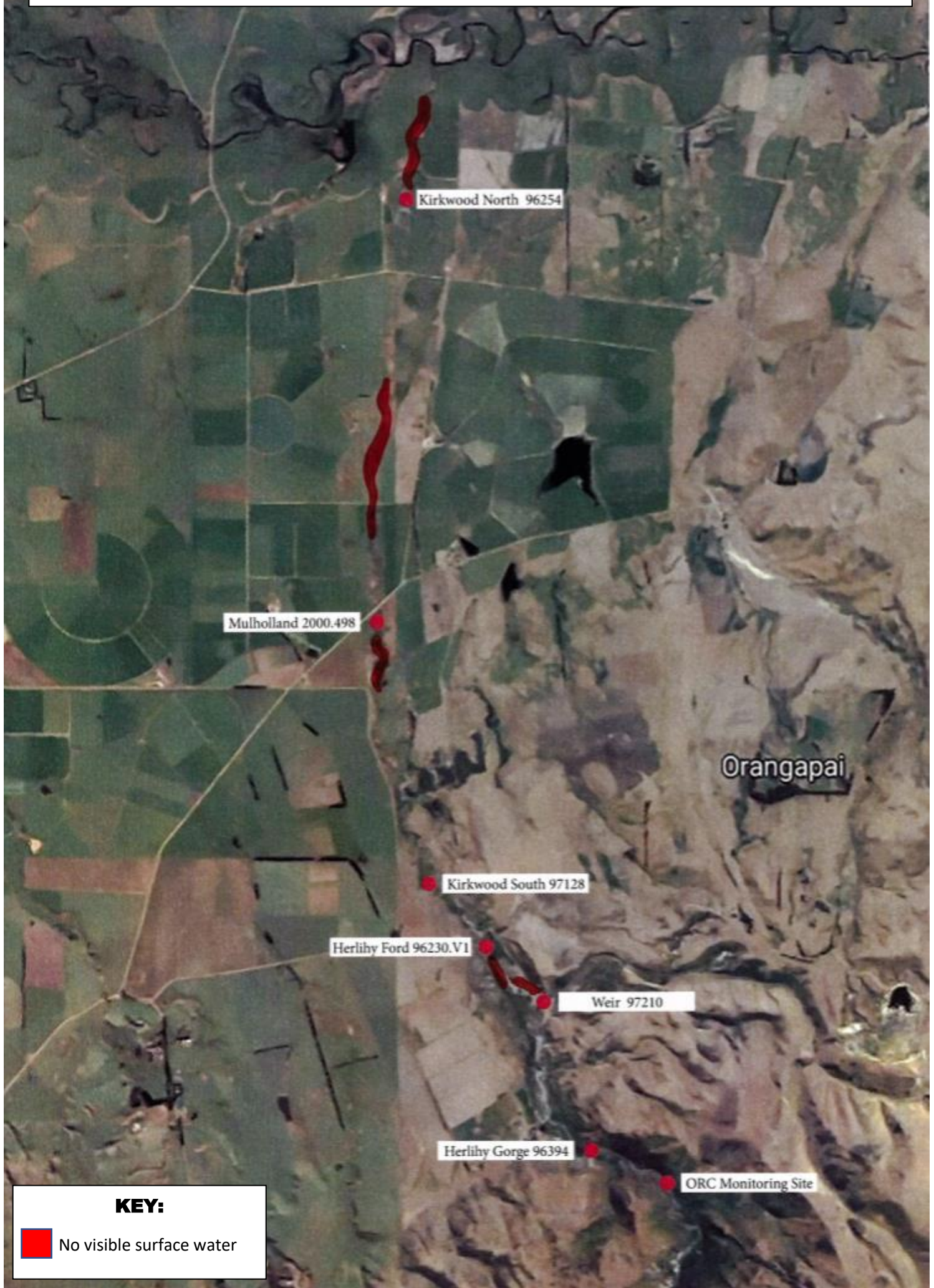
Map 2. Pigburn Creek observations 21st December 2016




KEY:

 No visible surface water

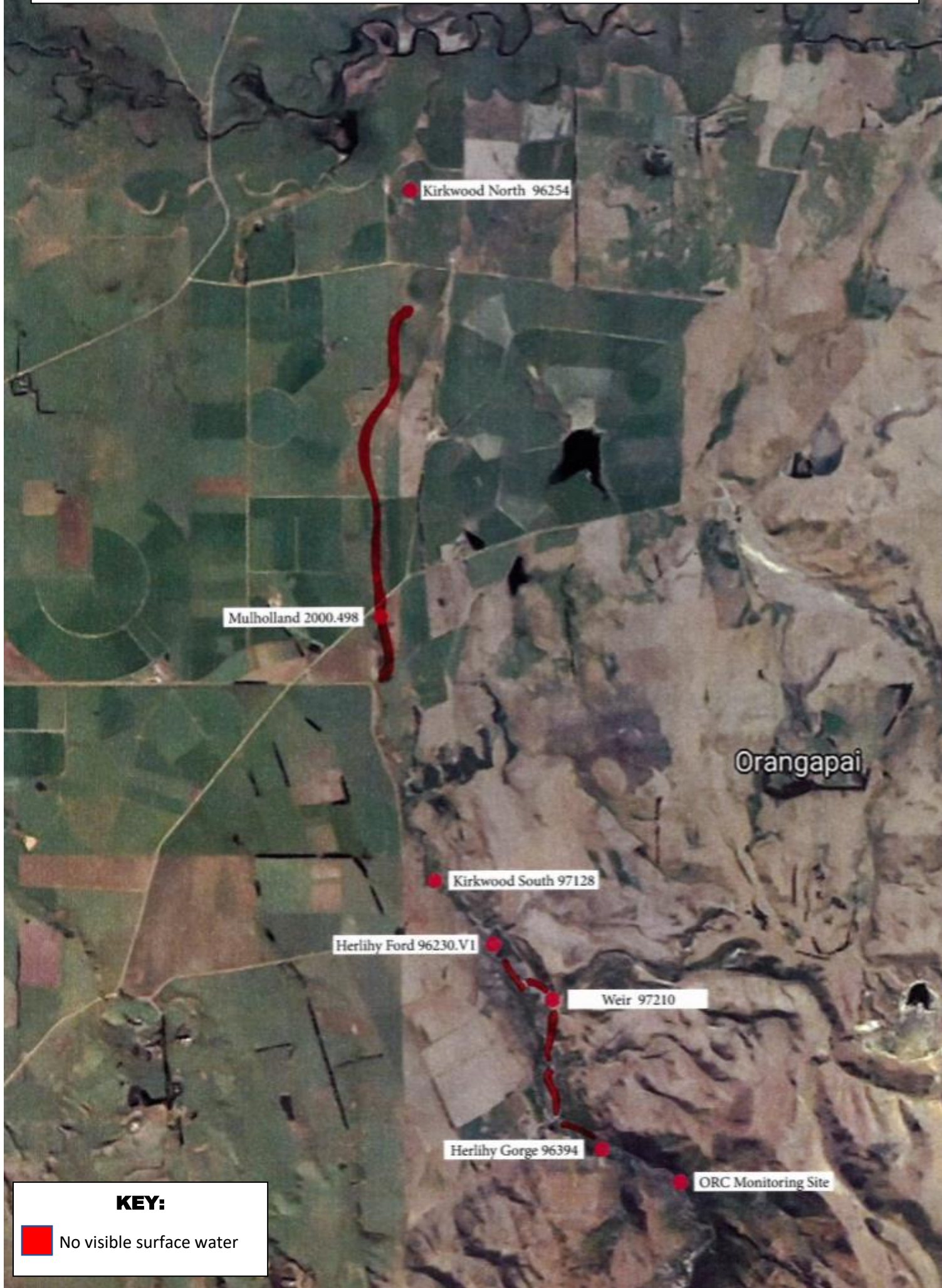
Map 3. Pigburn Creek observations 04th January 2017



KEY:

 No visible surface water

Map 4. Pigburn Creek observations 18th January 2017



KEY:


 No visible surface water



Image 3. Patearoa – Waipiata Rd Bridge



Image 4. Stock Crossing Kirkwood Dairy Farm

Image 4 is approx. 600m downstream of image 3, there are no abstractions between the two locations.
04/01/17

Map Observations:

Observation Date:	Commentary:
21 st December 2016	Approximately 20% of the creek bed has no visible surface water, this discontinuous flow is evident in three different sections of the creek.
4 th January 2017	Approximately 30% of the creek bed has no visible surface water, this discontinuous flow is visible in four different sections of the creek. It is important to note the length of creek bed the has no visible flow between the Mulholland and Kirkwood North takes. On this day a visual estimate of 20 l/sec was recorded flowing under the Patearoa – Waipiata bridge, this surface flow then completely disappears some 600metres downstream.
18 th January 2017	Approximately 45% of the creek bed has no visible surface water, this discontinuous flow is evident in two major sections of the creek. The longest section located between the Mulholland and Kirkwood North takes.

2017/2018 Season:

Low rainfall recorded in October and November in the Rock and Pillar ranges triggered a very early collapse of the natural flow of the Pigburn. This was compounded by a period of extreme heat in early January that resulted in very little amounts of water being available for abstraction, with substantial sections of the creek going dry. This near record dry period experienced in the late spring/early summer was broken on the afternoon of the 31st January when over 60mls of rain fell within 24 hours. This was followed by a similar rainfall two weeks later. These freakish summer rainfall events resulted in no further need for water to be extracted from the 31st January to the end of the irrigation season.

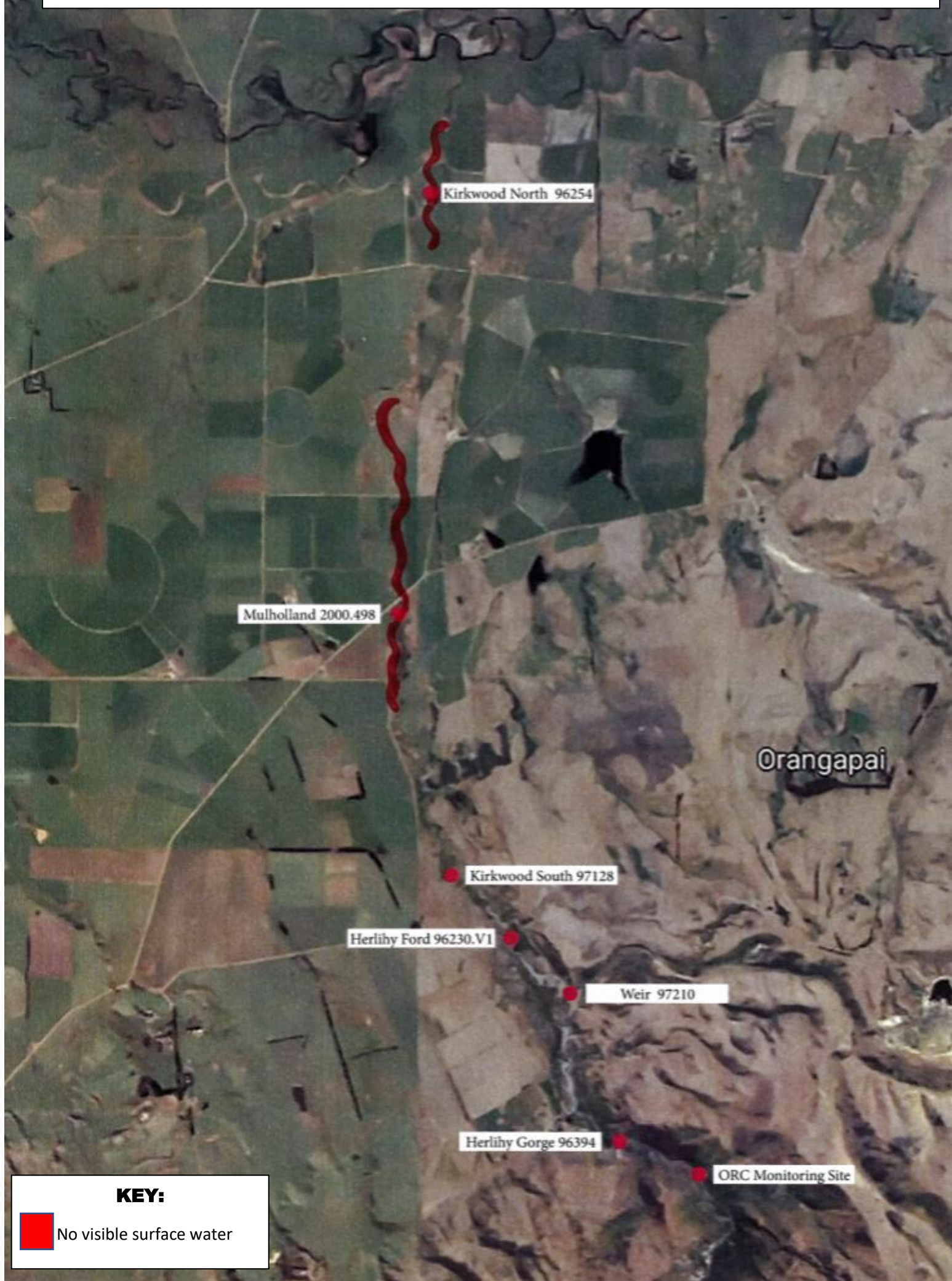
The results of the fortnightly monitoring are summarised in l/sec below:

Abstraction Location	Nov 8 th	Nov 22 nd	Dec 6 th	Dec 20 th	Jan 3 rd	Jan 17 th	Jan 31 st
ORC Monitoring Site	218	85	59	50	43	31	349
Herlihy Gorge	36	25	23	0	0	0	0
Weir	38	12	3	8	10	4	0
Herlihy Ford	26	21	10	15	11	8	3
Kirkwood South	21	21	16	15	13	2	10
Mulholland	20	20	3	7	2	10	3
Kirkwood North	25	25	31	21	5	5	2

Map Observations:

Observation Date:	Commentary:
20 th December 2017	Approximately 40% of the creek bed has no visible surface water, this discontinuous flow is evident in two major sections of the creek.
3 rd January 2018	Approximately 55% of the creek bed has no visible surface water, this discontinuous flow is evident throughout the length of the creek in four major sections.
17 th January 2018	Approximately 55% of the creek bed has no visible surface water, this discontinuous flow is evident throughout the length of the creek bed in the same sections of the creek as the 3 rd January.
31 st January 2018	Approximately 60% of the creek bed has no visible surface water, this discontinuous flow is evident throughout three major sections of the creek.

Map 5. Pigburn Creek observations 20th December 2017

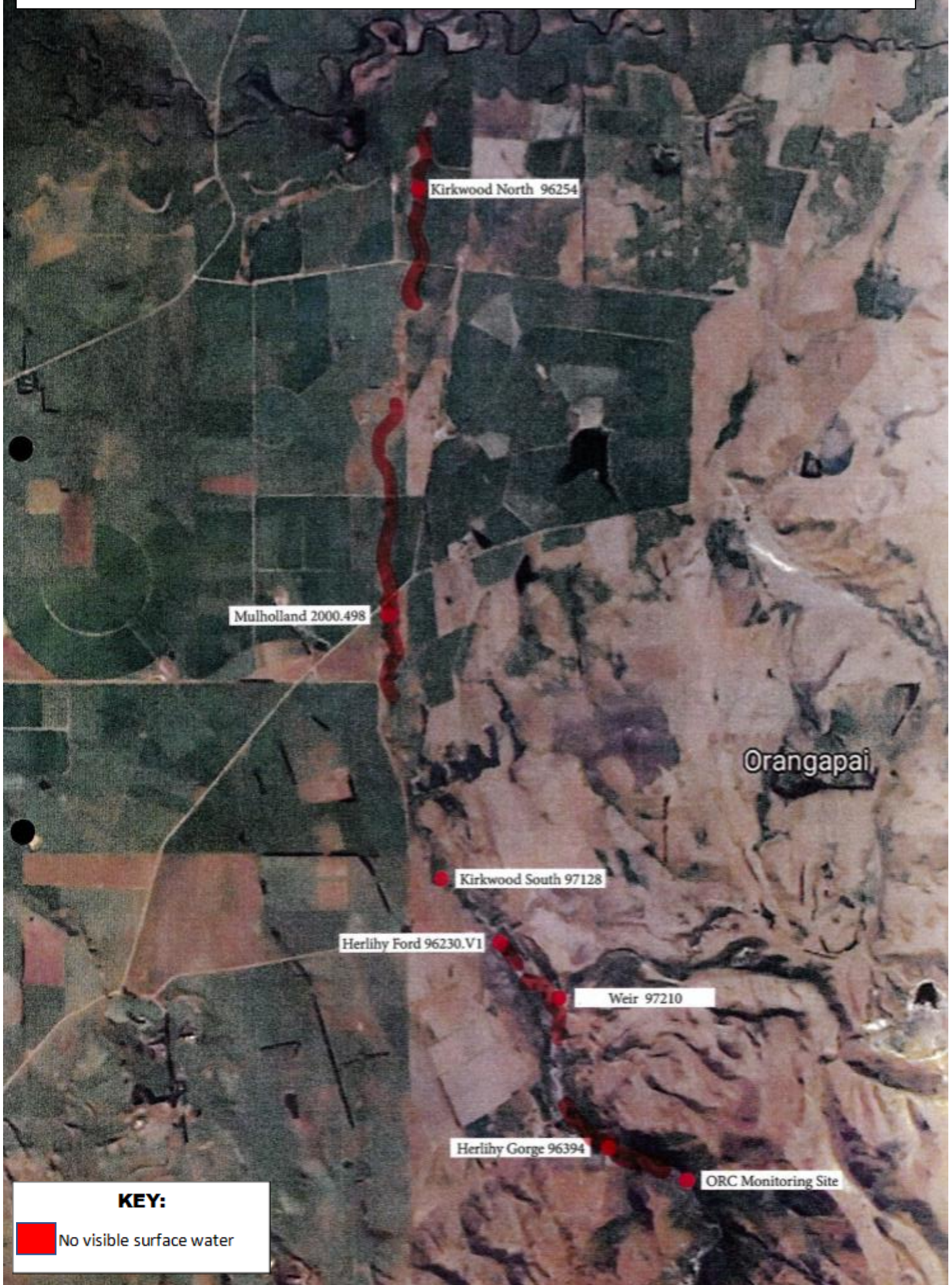


KEY:




No visible surface water

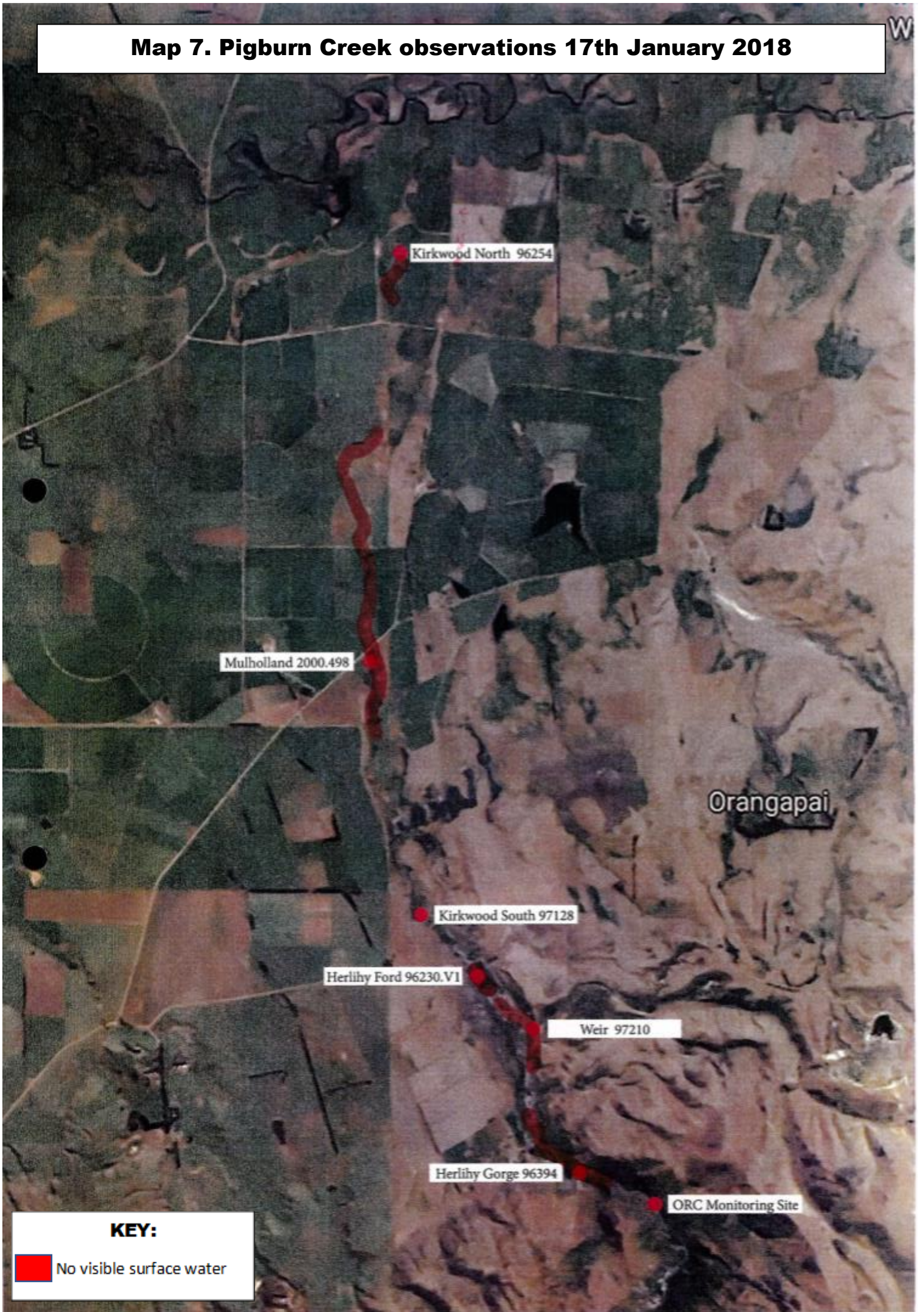
Map 6. Pigburn Creek observations 3rd January 2018




KEY:

 No visible surface water

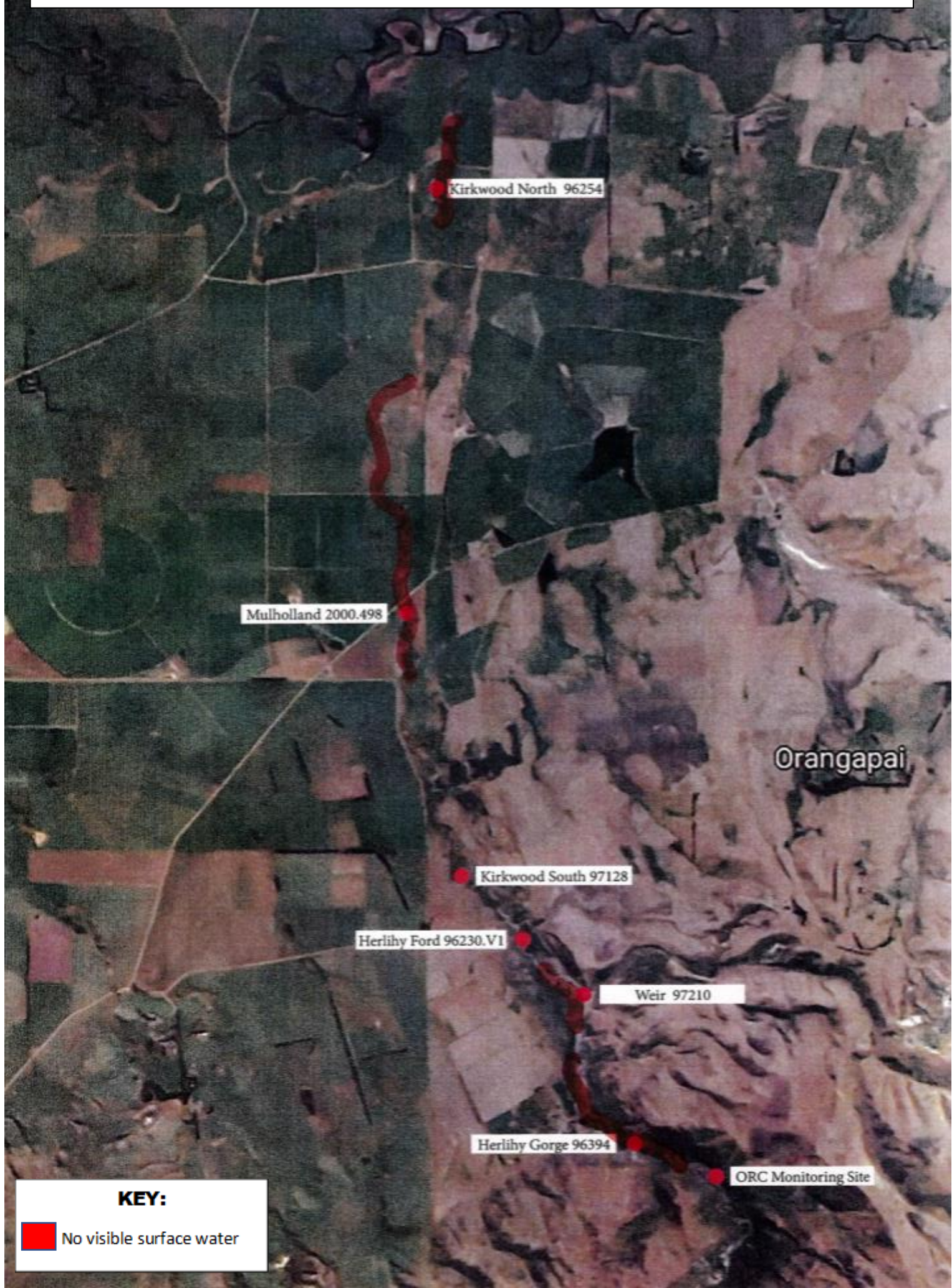
Map 7. Pigburn Creek observations 17th January 2018



KEY:


 No visible surface water

Map 8. Pigburn Creek observations 31st January 2018



Orangapai

KEY:

 No visible surface water

Appendix E: Methodology for Aqualinc Calculations

The Maps provided in this Application were developed using QGIS software. GIS layers were obtained from Aqualinc for

- Climate Zones
- Mean Annual Rainfall
- Profile Available Water

Other spatial data was also sourced from LINZ.

Data processing

- Climate Zone, MAR and PAW_MOD data was combined so that each unique combination is defined by a separate polygon.
- The data was then exported to Excel and the water demand calculated from the appropriate Aqualinc Table (climate zone, MAR, crop).
- Where PAW_MOD values fell between those listed in the Aqualinc Tables, a pro-rata calculation of water demand was made. For example, if PAW_MOD was 70, this is 1/3 of the way between the values in the table for PAW of 60 and 90. The pro-rata water demand was therefore calculated as 1/3 of the way between the demand values for 60 and 90.
- Where PAW_MOD values were lower than the lowest value in the Aqualinc tables, or higher than the highest, the lowest/highest value in the table was used, e.g. in a table giving values between 40 and 150, a PAW_MOD of 25 would be assigned the demand value in the table for 40, and a PAW_MOD of 200 would be assigned the value for 150. The range of values in the tables varies for each crop: 40-150 for pasture, 40-200 for grapes, 60-200 for cherries/apricots, and 120-150 for vegetables.