

CULTURAL VALUES REPORT

Arrow River / Wakatipu Basin Aquifers

Cardrona River



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This report has been prepared for Otago Regional Council on behalf of Te Rūnanga o Moeraki, Kāti Huirapa Rūnaka ki Puketeraki, Te Rūnanga o Ōtākou and Hokonui Rūnanga (Kāi Tahu ki Otago) and Te Rūnanga o Waihōpai, Te Rūnanga o Awarua and Te Rūnanga o Ōraka-Aparima (Kāi Tahu ki Murihiku). Intellectual property rights are reserved by these rūnanga.

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- Te Rūnanga o Moeraki
- Kāti Huirapa Rūnaka ki Puketeraki
- Te Rūnanga o Ōtākou
- Hokonui Rūnanga
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- Te Rūnanga o Awarua
- Te Rūnanga o Ōraka-Aparima
- Key informants and site evaluation participants.
- Peter Petchey and Brian Allingham.

Front Cover: The confluence of the Cardrona and Clutha rivers. Photograph: Maree Kleinlangevelsloo

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Executive Summary

The Arrow and Cardrona catchments and the Wakatipu Basin are highly valued by the whānau of Kāi Tahu ki Otago and Murihiku (Kāi Tahu). Ara tawhito (trails), ran through these catchments, bringing whānau into the southern lakes and rivers on their seasonal pursuit of resources. Today the rivers are used for recreation, and are valued for their landscape qualities and the species residing in them. They are treasured places where whānau have grown up and spent time together. In the Cardrona River, whānau want to see tuna (longfin eel) re-established, and are particularly concerned about the wellbeing of the Upper Clutha non-migratory galaxids. This report outlines these and other values to inform the minimum flow setting processes being run by the Otago Regional Council for the rivers and associated aquifers.

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1 Introduction

This report describes the values and aspirations that Kāi Tahu ki Otago and Murihiku rūnanga hold for the Arrow River, the Wakatipu Basin aquifers, and the Cardrona River and its connected aquifers. The Otago Regional Council is setting a minimum flow for these respective rivers and an allocation limit for the Wakatipu Basin aquifers.

A minimum flow is the lowest flow deemed acceptable for a river before all taking of water must stop. A minimum flow aims to protect aquatic ecosystems, the natural character of rivers, recreational and cultural values. When a river drops below its minimum flow, anyone with a consent to take water (other than for municipal supply and stock drinking water) must stop taking. An allocation limit is the total amount of water that all water permit holders are allowed to take from a catchment or aquifer.

Kāi Tahu ki Otago and Murihiku whānau are of Kāti Rapuwai, Waitaha, Kāti Māmoe and Kāi Tahu descent. Seven Kāi Tahu rūnanga have interests in the Arrow and Cardrona catchments; four from Otago (Te Rūnanga o Moeraki, Kāti Huirapa Rūnaka ki Puketeraki, Te Rūnanga o Ōtākou and Hokonui Rūnanga) and three from Murihiku/Southland (Te Rūnanga o Awarua, Te Rūnanga o Waihōpai and Te Rūnanga o Ōraka-Aparima). Kāi Tahu had a culture, language and traditions intricately linked to Te Waipounamu before European settlement. They had a unique local system of resource use and management. They are Mana Whenua and represent the mana of the land and waterways.

Kāi Tahu whānui view the environment holistically. Many of the values and observations in this report relate to the Cardrona and Arrow rivers as a whole, rather than just to water quantity.

The Otago Regional Council (ORC) is running two distinct processes; one for dealing with the Arrow River and Wakatipu Basin aquifers; and another for the Cardrona River and its connected aquifers. Because many of the Kāi Tahu values for these waterways are similar, and for efficiency, they are being dealt with jointly in this report.

2 Takata Whenua

2.1 Introduction

‘Takata Whenua’ literally means ‘people of the land’ and is often used to refer to the whānau (families), hapū (sub-tribes) or iwi (tribe) of a particular area who are recognised as holding the traditional rights and responsibilities within that area to manage and govern natural resources. For the purposes of the Te Rūnanga o Ngāi Tahu Act 1996, Papatipu rūnanga represent the individual beneficial rights of Ngāi Tahu members. In the Central Otago takiwā these are Kāti Huirapa Rūnaka ki Puketeraki, Te Rūnanga o Moeraki, Te Rūnanga o Ōtākou, Hokonui Rūnanga, Waihopai Rūnaka, Te Rūnanga o Ōraka/Aparima, and Te Rūnanga o Awarua. These rūnanga share an area of interest in the inland lakes and mountains of Otago.

Te Rūnanga o Moeraki

The coastal takiwā of Te Rūnanga o Moeraki is based at Moeraki and extends from the Waitaki River to the Waihemo (Shag) River. The interests of Te Rūnanga o Moeraki are concentrated in the Moeraki Peninsula area and surrounds, including Te Rakahineatea Pā, Koekohe (Hampden Beach), and Te Kai Hīnaki (the Boulders Beach) with its boulders. In addition, the interests of the Rūnanga extend both north and south of the Moeraki Peninsula, within their takiwā.



Kāti Huirapa Rūnaka ki Puketeraki

The takiwā of Kāti Huirapa Rūnaka ki Puketeraki centres on Karitāne and extends from the Waihemo River (Shag River) to Purehurehu (north of Heywards Point). The strategic coastal headlands for the Rūnaka are Matanaka (Cornish Head), Huriawa Peninsula, Pā Hāwea, Brinns Point, Mapoutahi, Kaiweka/Potato Point and Heywards Point.



Te Rūnanga o Ōtākou

The coastal takiwā of Te Rūnanga o Ōtākou centres on Ōtākou and extends from Purehurehu to Te Matau and inland, sharing an interest in the lakes and mountains to the western coast with Rūnanga to the north and south.



Hokonui Rūnanga

The takiwā of Hokonui Rūnanga centres on the Hokonui region and includes a shared interest in the lakes and mountains between Whakatipu-Waitai and Tawhitarere with other Murihiku Rūnanga and those located from Waihemo southwards.



Te Rūnanga o Awarua

The takiwā of Te Rūnanga o Awarua centres on Awarua and extends to the coasts and estuaries adjoining Waihopai sharing an interest in the lakes and mountains between Whakatipu-Waitai and Tawhitarere with other Murihiku Rūnanga and those located from Waihemo southwards.



Te Rūnanga o Waihōpai

The takiwā of Waihopai Rūnaka centres on Waihopai and extends northwards to Te Mata-au sharing an interest in the lakes and mountains to the western coast with other Murihiku Rūnanga and those located from Waihemo southwards.



Oraka-Aparima Rūnaka

The takiwā of Te Rūnanga o Ōraka-Aparima centres on Ōraka and extends from Waimatuku to Tawhititarere sharing an interest in the lakes and mountains from Whakatipu-Waitai to Tawhititarere with other Murihiku Rūnanga and those located from Waihemo southwards.



3 Background

3.1 Cardrona catchment

The Cardrona catchment is situated between Arrowtown and Wanaka (Figure 1) in the upper Clutha River/Mata-Au valley. The Cardrona River flows in a north-north-easterly direction, 40 km down the Cardrona valley. Its headwaters originate at Mt Scott on the Crown Range. Topography in the catchment varies from river flats in the lower reaches to the short steep slopes of the Criffel Range, to the higher undulating hills on the western side of the valley. A severe rainfall deficit occurs during summer, with typical January - February rainfall totals approximately half of the potential evapotranspiration rate, leading to a high demand for irrigation water.

Tributaries include Boundary Creek, Little Meg Creek, Pringle Creek, Spotts Creek, Stoney Creek and Timber Creek. At the end of the valley at “The Larches” (also known as Mt Barker, see Figure 2), the river crosses about seven kilometres of relatively flat plains south-east of Wanaka, before discharging into the Clutha River/Mata-Au at Albert Town. The lower catchment often experiences low flows and most years some sections of the river dry up, particularly downstream of The Larches where the ORC has a flow recorder site. The upper catchment is dominated by sheep and beef farming.

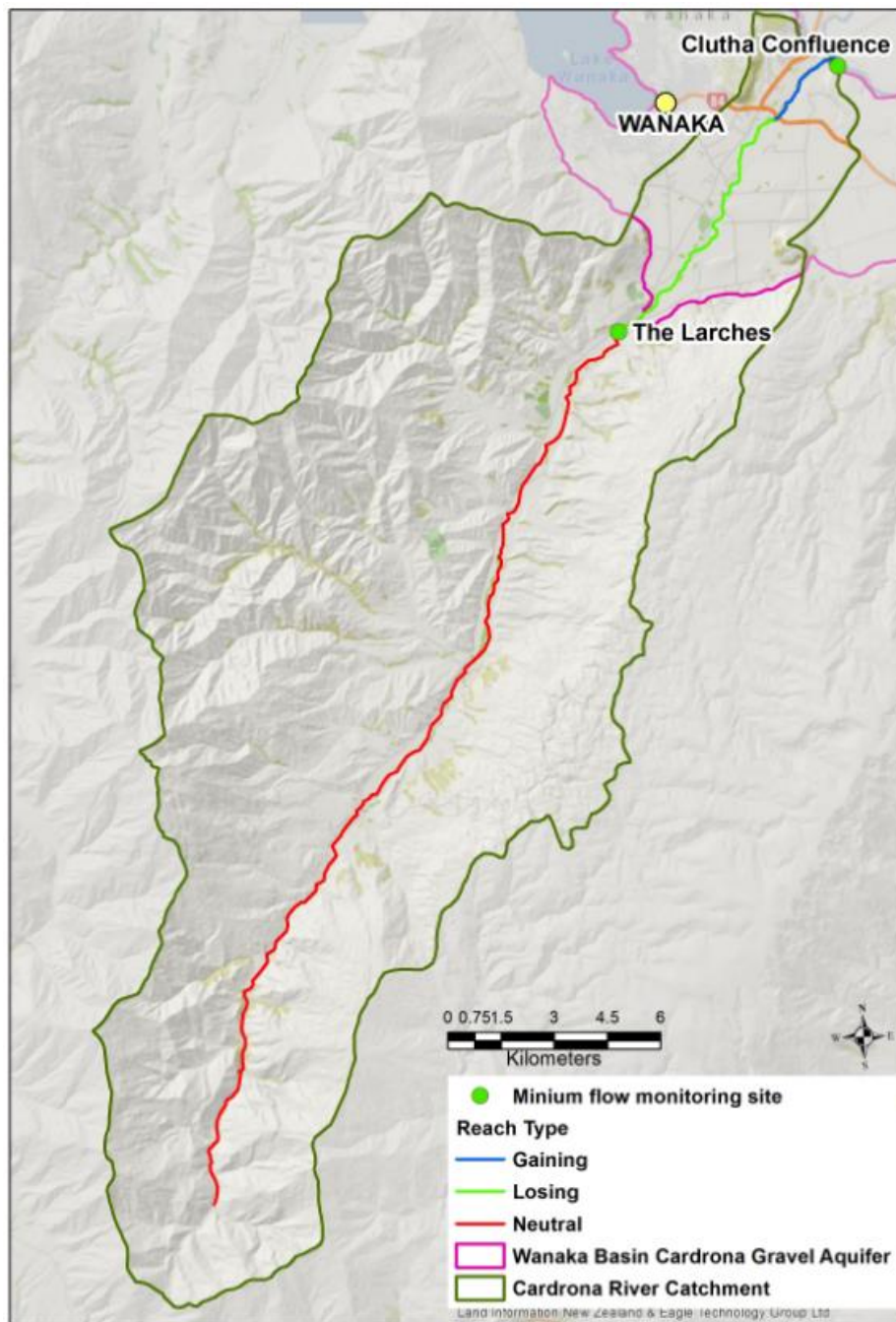


Figure 1: Cardrona catchment. Source: Otago Regional Council

The Wanaka Basin-Cardrona gravel aquifer (Figure 2) is located between Lake Wanaka, the Upper Clutha River/Mata-Au, the Criffel Range and Mount Roy. This aquifer is responsible for the flow of Bullock Creek through Wanaka. The aquifer also contributes to the periodic drying of sections of the Cardrona River during summer due to infiltration.

The Cardrona Alluvial Ribbon Aquifer comprises the river flats which extend from Little Meg Creek in the south to The Larches in the north. This water is treated as surface water, because of its connections to the river.

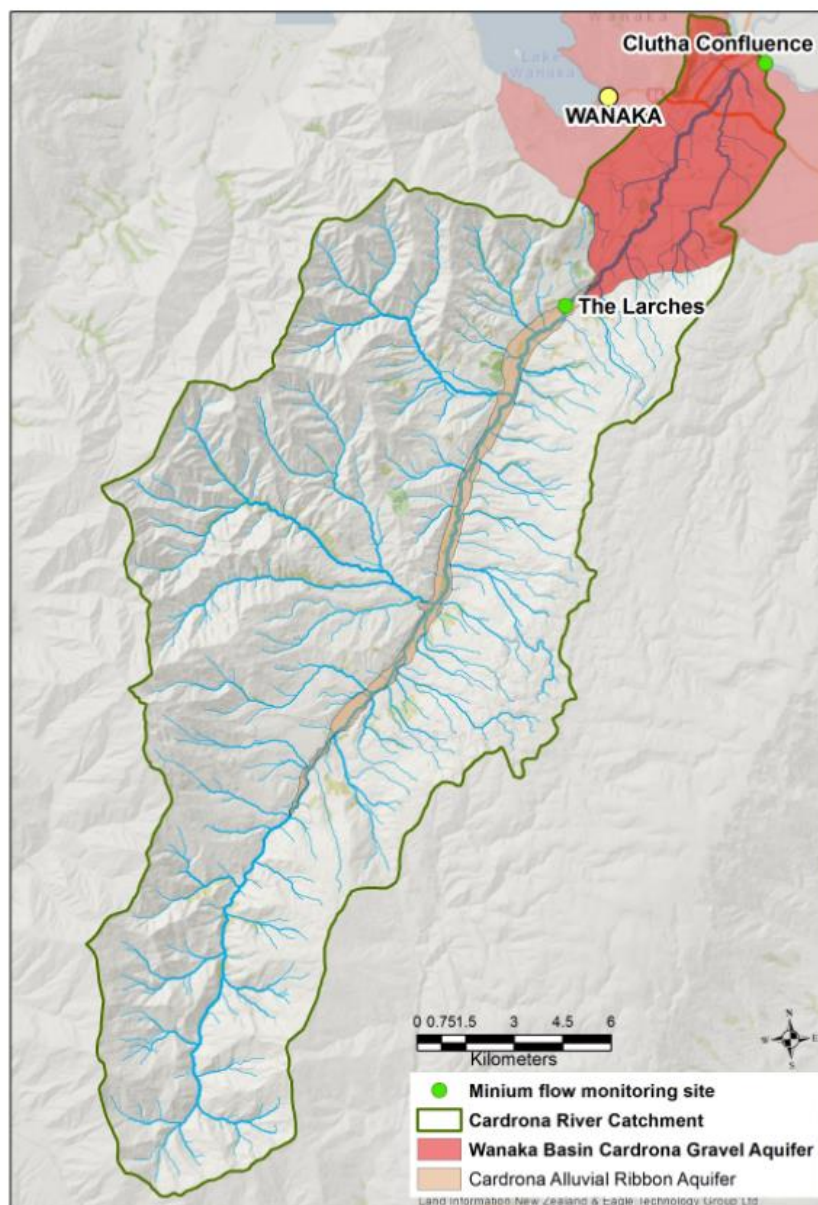


Figure 2: Cardrona aquifers. Source: Otago Regional Council

There are 41 consented surface water takes (Figure 3) from the Cardrona River and its tributaries. Additionally, there are groundwater takes from the connected Cardrona Alluvial Ribbon Aquifer and the Wanaka Basin-Cardrona Gravel Aquifer. There are currently 14 deemed permits (mining privileges) in the Cardrona catchment.

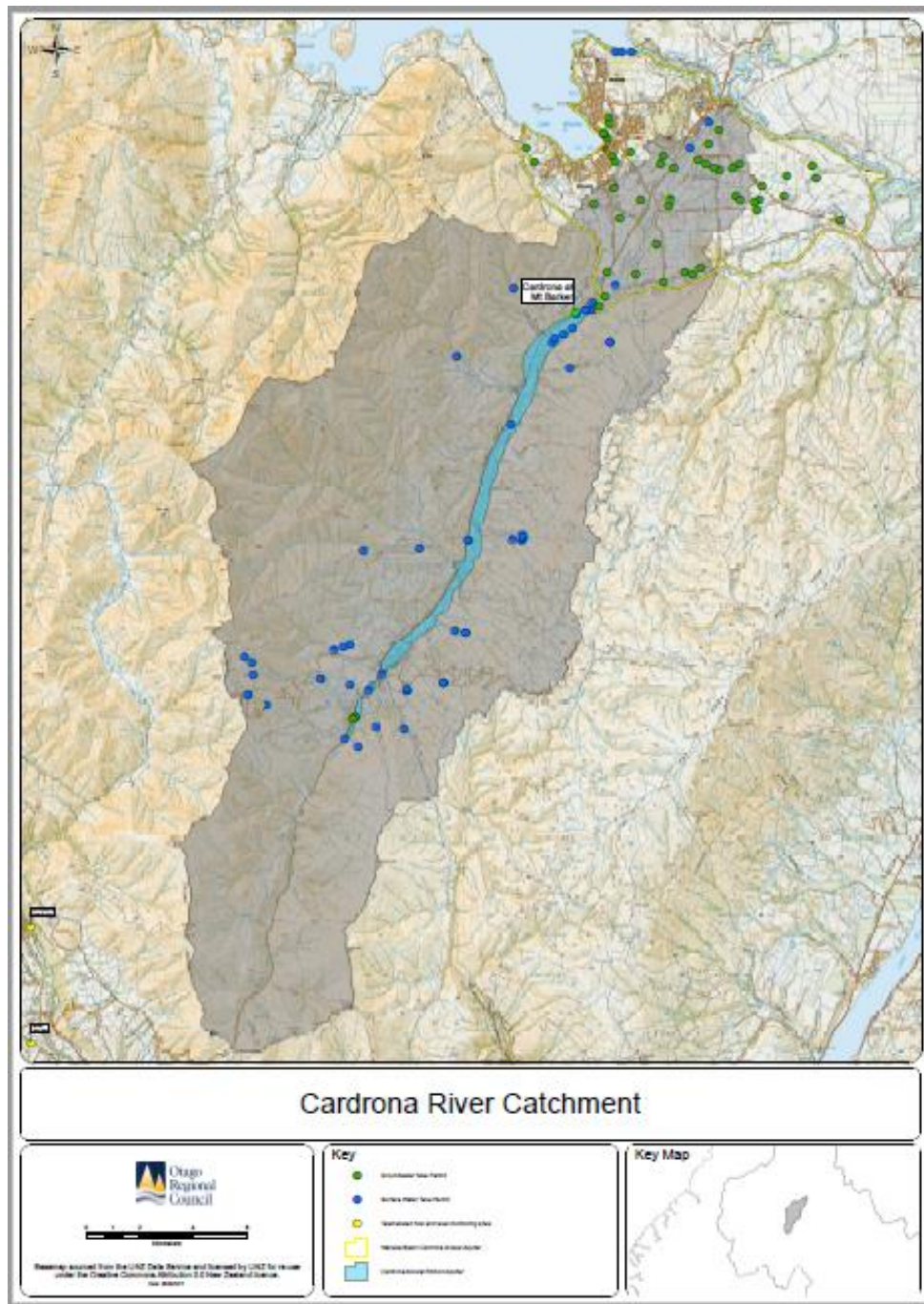


Figure 3: Consented takes from the Cardrona catchment (groundwater green; surface water blue). Source: ORC

3.2 Arrow catchment and Wakatipu Basin

The Arrow catchment (Figure 4) is located in the Queenstown Lakes district. The Arrow River flows approximately 50 km from its headwaters to the south of Arrowtown and the east of Lake Hayes, running alongside the terraces of the Wakatipu Basin to its confluence with the Kawarau River. The headwater hills are the Harris Mountains, Mt Soho and Mt Cardrona. Soho Creek, Eight Mile Creek and the Rich Burn are significant tributaries. Bush Creek joins the Arrow River at Arrowtown.

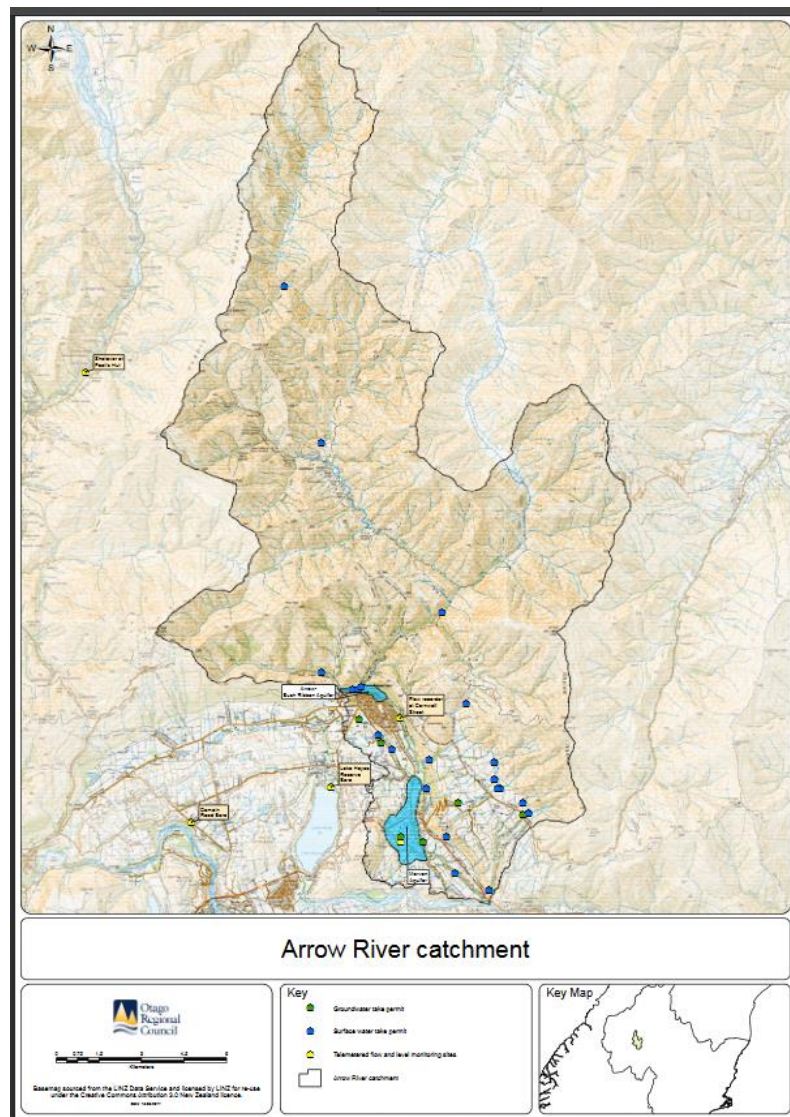


Figure 4. The Arrow River catchment. Source: ORC

There are 23 existing surface water takes in the Arrow catchment and 15 deemed permits. The river is approximately three times over-allocated. Water is used for irrigation, community supply, rural-residential development and tourism. Water from the Arrow River is also used to irrigate land in the Wakatipu Basin. There would probably be longfin eel in the Arrow River were it not for the Roxburgh and Clyde dams acting as barriers. A single record for a koaro in a tributary exists.

The nine Wakatipu Basin aquifers (Figure 5) are bound by Coronet Peak, Crown Terrace, the Kawarau River and Lake Wakatipu. The basin is located at the terminus of three large rivers: the Kawarau, the Shotover and the Arrow. Of the nine aquifers, the Arrow Bush Ribbon, the Shotover Alluvial and the Kawarau Alluvial aquifers are connected to surface water.

There are 13 groundwater takes from the Wakatipu Basin aquifers. Municipal, communal and domestic water supplies are the main uses. The Arrow Irrigation Company serves several golf courses with significant water requirements.

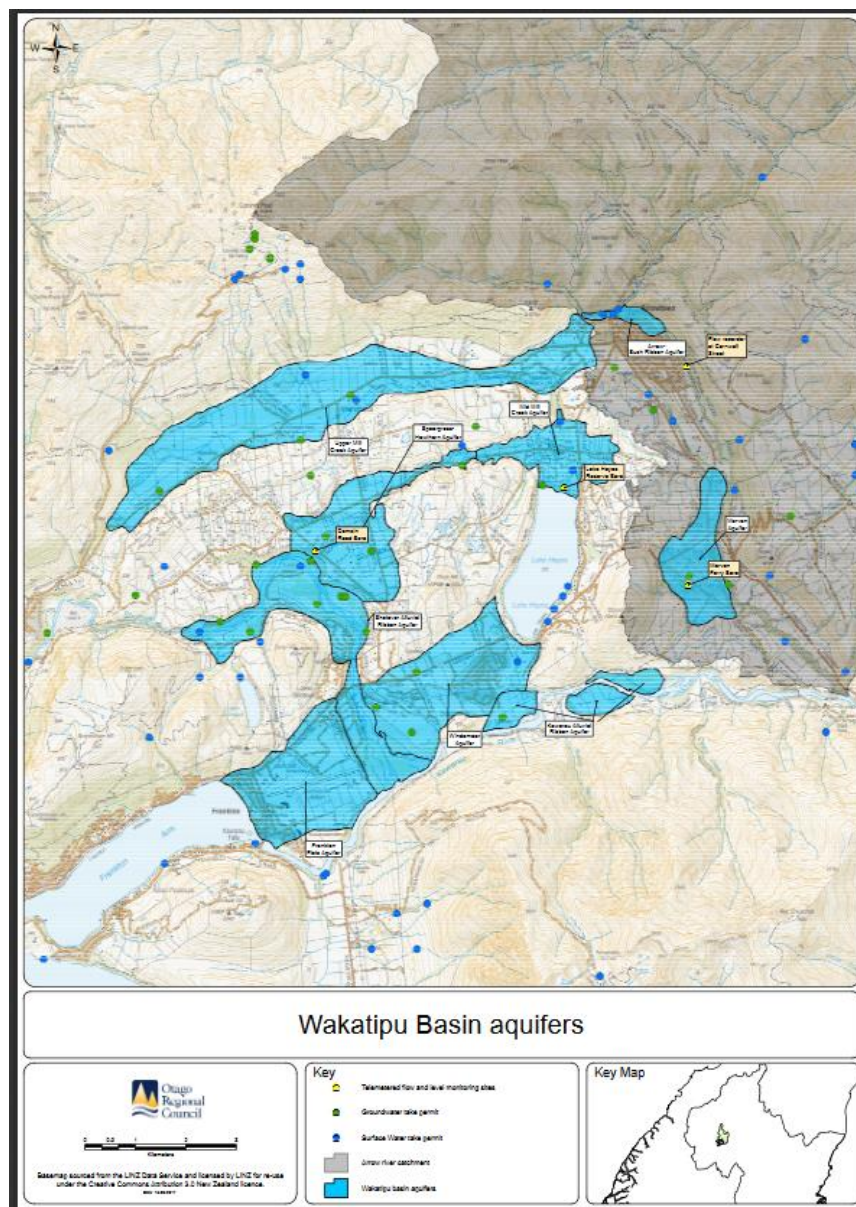


Figure 5: Wakatipu Basin aquifers. Source: ORC

4 Methodology

The values described in this report were determined through three key methods:

- Literature review
- Site visit
- Interviews with key informants

Secondary information was sourced from libraries and the internet. Archival material from the New Zealand Archaeological Association site recording database was accessed. The Ngāi Tahu Cultural Mapping Project was accessed. Two archaeologists were contacted. Three rūnanga members, staff from both Kāi Tahu Ki Otago Ltd and Te Ao Marama Ltd, and staff from the Otago Regional Council went on a site visit to the Wakatipu Basin, Arrow River and Cardrona River on 17-18 August 2017. Key informant interviews were undertaken with four whānau members who have lived in either Arrowtown or Wanaka and have had a long term association with the rivers and their environs.

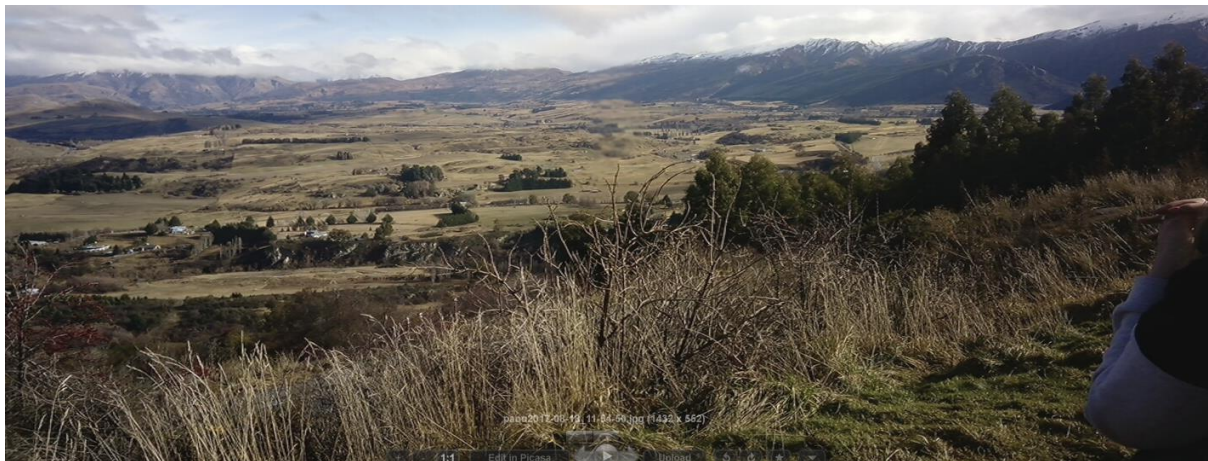


Figure 6: The Wakatipu Basin

5 Literature Review

This chapter examines the values and uses of the Arrow and Cardrona catchments from early occupation to the present day.

Birdlife was abundant in the inland South Island and was widely used.¹ Several species of **moa** and a number of **water fowl** species were caught. After the decline in the moa species, **weka**, **koreke** (New Zealand quail) and **tuna** (eel) provided protein staples, while **aruhe** (bracken fern root) and the stem of the edible **tī** (cabbage tree) were sources of carbohydrate. **Weka** are believed to have been of considerable importance and the Arrow Valley was an original **birding area** for these ground birds.² Recently the **Buff weka programme** developed by Ngāi Tahu and the Department of Conservation has been supported by Soho Property Limited with the reintroduction of native buff weka in breeding pens.³

Māori **occupation** and seasonal hapū/whānau **heke** (migrations) to Central Otago were in decline by the time of European settlement of the inland lakes. The last accounts of **kāika** (settlements) are known from the stories of Puoho's raiding party on the lakes, from which Anderson (1982)⁴ draws the conclusion that 'few more than 20 people were distributed, largely on family lines, amongst four or five settlements in the Wanaka-Hawea district but none were living elsewhere along the main trail to the south', and that occupation consisted of temporary encampments.

Hunting parties set out to Central Otago, including the Arrow and Cardrona, to obtain **resources** throughout the year, depending on when the resource was at its best. Tuna were captured during summer, whereas weka were fattest during winter.⁵ **Seasonal visits** to the inland lakes were still being undertaken in the 19th century, and were recorded by early European settlers. A well-documented example is of the party of Moeraki whānau in 1865⁶ and an undated report of Waikouaiti Māori camped at the top end of Wakatipu.⁷ Ōtākou hapū were frequenting the Arrow and Cardrona, Te Waipapa o Karetai (the calabash of Karetai). The name attests to its relevance to Ōtākou whānau as a **mahika kai destination**. **Fishing and gathering** was much in evidence during

¹ Petchy P. 1995. Upper Clutha River, Pre-historic Archaeological Assessment. Report to ECNZ.

² A. Anderson 1982. Maori settlement in the interior of Southern New Zealand from the early 18th to late 19th centuries A.D., by, Volume 91 1982 Volume 91, No. 1 p 53-80.

³ <http://www.stuff.co.nz/southland-times/news/76670100/Weka-breeding-programme-at-picturesque-Motatapu-Station-is-backdrop-to-annual-race>

⁴ Ibid. 2

⁵ Ibid. 2

⁶ Anderson A. 1998. The Welcome of Strangers. An ethnohistory of southern Maori A.D. 1650 – 1850. Otago University Press.

⁷ Duncan, A. H. 1888. The Wakatipians. Capper Press.

European settlement. In some cases, **mōkihi** (rafts) were used and the return trip to the coast was relatively swift. **Potato gardens**⁸ are thought to have made **permanent settlements** possible for a time around Whakatipu, Hawea and Wanaka, part of the shifting resource adaptation of Kāi Tahu during early European contact.⁹ Evidence of **occupation** in the interior included whare rau, which were used by the miners, and abandoned eel nets and stakes.¹⁰

Much **archaeological evidence** has been lost as a result of artificial damming and goldmining, so the New Zealand Archaeological Association resources do not accurately represent the extent of Kāi Tahu association with these areas.

Archaeologist Brian Allingham (pers. comm. 2017) provided detail about Kāi Tahu's intimate **knowledge and use** of the Arrow and Cardrona catchments. According to Allingham Kāi Tahu/Murihiku values are very evident in the landscape associated with the Arrow and Cardrona Rivers, although they are not widely known. The Arrow and Cardrona Rivers both had **trails** running alongside them. As one of the easiest passes, the route along the Cardrona and over the **natural bridge** at the Roaring Meg would have been a major **ara tawhito** providing an important link to the Nevis and down into Southland. "The trail over the Cardrona was a very important, very easy route. It's an obvious and important link in the network of trails" (Allingham, pers. comm. 2017). There are many large **rock shelters** and a **cave** on this route that would have been well used.

Allingham details a well-developed track alongside part of the Arrow River near a distinctive rock shelter containing **Māori rock art**. Further downstream, a **pā site** from the Ngāi Tahu period sits up on a ridge. This is not recognised archaeologically, and much of the area has not been investigated for archaeological remains. However, the papers penned by HK Taiaroa in 1880 that outline many of the places used by Kāi Tahu in inland Otago, match **the archaeological evidence**.

The ara tawhito are Kāi Tahu **taoka (treasures)**. The network of trails connected Canterbury and coastal Otago to the inland lakes, and on into Southland or the west. The routes followed the valleys and crossed saddles but also utilised and harnessed the powers of the river systems. The old routes followed the road of least resistance and in many cases, have been built over with sealed and gravelled roads. Many of the old goldminers' routes are likely to have followed older well-trod ara tawhito. Fox's Gully¹¹ in the Cardrona is thought to be one such trail (Petchey 2017 pers. comm). The original Māori trail which followed up the Cardrona valley was later well trod by goldminers¹² either

⁸ Ibid. 6

⁹ Simmons DR. 1969. Economic change in New Zealand prehistory. 78(1) 3 – 34.

¹⁰ Ibid. 6

¹¹ Petchey, P. 1999: Cardrona Valley archaeological survey. Unpublished report for Southroads Ltd, Dunedin. 15, Plate VII and Figure 9).

¹² Ibid. **Error! Bookmark not defined.**

up over Fox's Gully into the Arrow or through the Roaring Meg, down to the Nevis (Figure 9). The Wakatipu **pounamu** field was a highly valued **stone resource**¹³ and trips to the coast, via Haast Pass/Tiorepatea) were common, where pounamu could be found or traded. Roaring Meg was an important *ara tawhito*¹⁴ as it led to the **natural bridge over the Kawarau River**.

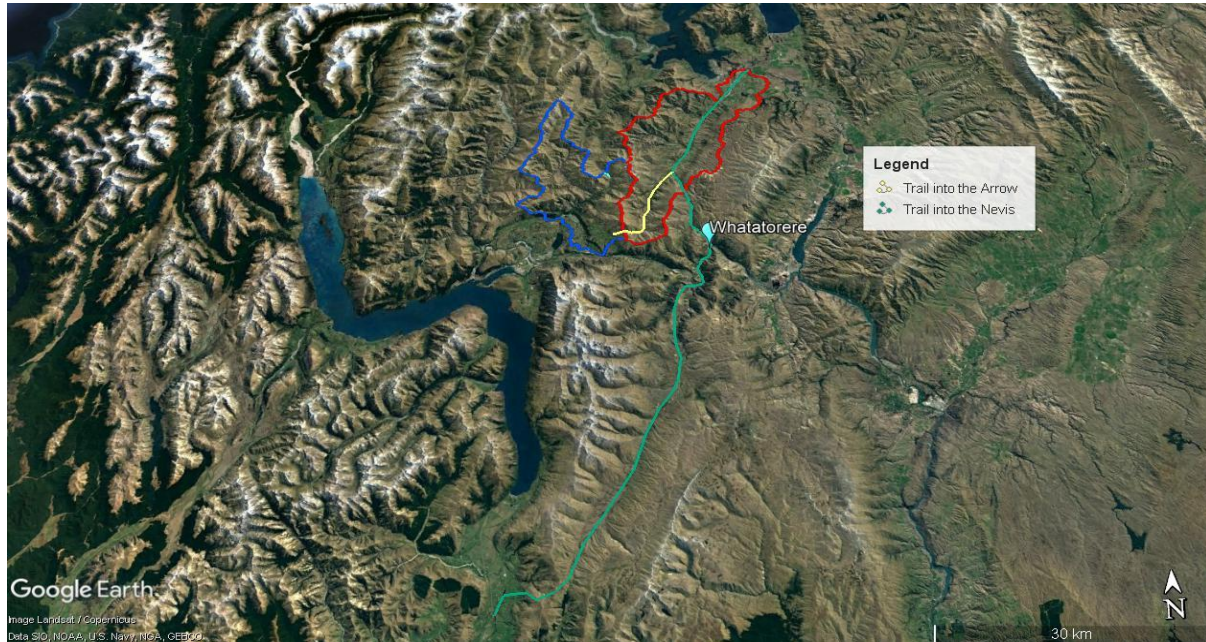


Figure 9: The Cardrona (red) and Arrow (blue) catchments with trails into Murihiku (green) and the Arrow (yellow) across the natural bridge Whatatorere.

The natural bridge on the Kawarau was used by Māori to cross what was the considerable impasse of the Kawarau. The river margin has a **nohoaka** (canoe landing site) associated with it¹⁵, the **Whatatorere Historic Reserve**, which is vested in Kāi Tahu.¹⁶ This is a very significant site for Kāi Tahu. The bridge has several names associated with it. Anich (2000) reports it as **Potiki whaka rumaki nao**, meaning a place where ducks escaped capture by passing through the narrow waterway between the rocks. In the Ngāi Tahu Claims Settlement Act 1998, the name Whakatorere was accepted as the descriptor. The structure of the bridge was unusual in that it almost spanned the width of the gorge, approximately 20m across and 10m high. Duncan (1888),¹⁷ described it as 'where the rocks overhang the stream so far that one can jump across the gap, if the roaring torrent below is not too much for the nervous system.' The gap in the bridge was subsequently spanned with planks, until the whole thing was washed away in the historic 1878 flood (Petchey pers. comm.).

¹³ KTKO 2006. Cultural Values Report for: Cardrona Valley. Site Inspection – 2nd April 2006.

¹⁴ DOC 2002. Waitiri Pastoral Lease Tenure Review. Conservation Resources Report

¹⁵ 1998 The Ngai Tahu Claims Settlement Act

¹⁶ DOC 2016 Otago Conservation Management Strategy. Volume 1.

¹⁷ Ibid. 7

There is reported to be another ledge that can be walked when the river is very low (pers. comm. H. Langsbury).

The **Ngāi Tahu place names** mapping data for the catchments (Appendix 1) further illustrates the extensive use and occupation of the catchment.

A number of Kāi Tahu people saw the gains to be had from joining the 19th century **gold rush** and worked as labourers and shearers. In 1862 Māori miners were recorded catching weka and laughing owls (Anderson 1982)¹⁸. The heroic account of big Jack Tewa rescuing a drowning friend, in 1861,¹⁹ after capsizing in Lake Wakatipu, is related by Duncan (1888). The story is testament to the strength and endurance of the old people and their propensity to call on the ‘other world’ when needed, as Jack is described as chanting a “Maori death song”, while in the water. The location on the lake of **Jack’s Point**²⁰ is by local legend named after Jack Tewa in recognition of the incident. The credit of finding of gold up the Arrow in 1865, also goes to Jack Tewa, although in the account given by Pyke (1887) ‘Maori Jack’ is Hatini Whiti.²¹

After Māori fires and extinctions, the impact of gold mining and pastoralism on the decline of **indigenous flora and fauna** was profound. The transfer of huge areas of land to pastoral leases largely excluded Kāi Tahu, who had unsuccessfully applied for a pastoral lease.²² In an attempt to retain their **access to traditional lands and resources** the people of Moeraki undertook a heke inland in 1877²³. Their original objective was Wanaka, but they resided at Omarama until 1879, when they were forcibly ejected²⁴. From then on the primary economic activity then available to Kāi Tahu in the inland lakes region, was as labourers.

Native fish recorded in the catchments include longfin eel, Clutha flathead galaxias, koaro, common and upland bully (Figure 10). The significant presence of **Clutha flathead galaxias** is listed as a value of the catchment in Schedule 1A of the Otago Regional Plan Water. Clutha flathead galaxias are currently classified as ‘nationally critical’ (the highest threat classification in the New Zealand threat classification system). Longfin eel and **koaro** are classified as ‘declining’. Clutha flathead galaxias are mostly restricted to remote headwater tributaries of the Cardrona, likely due to the presence of trout and koaro.

¹⁸ Beattie, H. 1945. Maori Lore of Lake, Alp and Fiord. Dunedin, Otago Daily Times and Witness.

¹⁹ Roxburgh T. Otago Daily Times 2009. Location of heroic Maori Jack's remains still a mystery <https://www.odt.co.nz/regions/queenstown-lakes/location-heroic-maori-jacks-remains-still-mystery>

²⁰ <https://www.jackspoint.com/story-so-far/>

²¹ Pyke V. 1887. Early Gold Discoveries in Otago.

²² Ibid. **Error! Bookmark not defined.**

²³ Taylor WA.1952. Lore and history of the South Island Maori. Bascands Ltd, Chch.

²⁴ <https://teara.govt.nz/en/biographies/1t48/te-maiharoa-hipa>

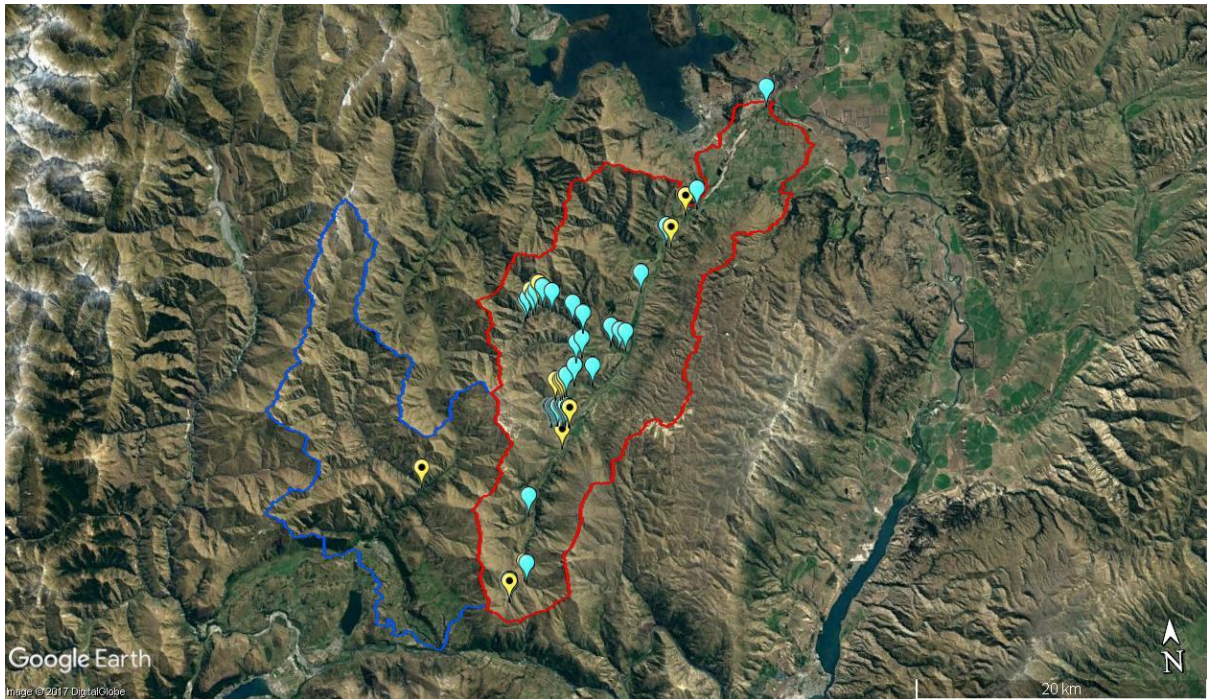


Figure 10. The Cardrona (red) and Arrow (dark blue) river catchments and New Zealand Freshwater Fish Database records for Koaro (yellow) and Upper Clutha Flathead (blue).

Both catchments are relatively depauperate of native fish, due to the impact of both dams on fish passage and predatory salmonids on the two species of galaxias present. The irrigation weir in the lower Arrow catchment prevents upstream fish access for a larger part of the river. A single native koaro (*Galaxias brevipinnis*) record exists in the New Zealand Freshwater Fish Database for the Arrow and there are no longfin eel (tuna).

The migratory koaro and non-migratory Upper Clutha Flathead (*Galaxias vulgaris* complex Species D), are the two galaxias species present in the Cardrona. The Clutha Flathead, now assessed as Critically Endangered, are present through the Cardrona, though their distribution is shrinking to remnant populations in the upper stream tributaries. Koaro are present in the valley and tributaries. Eel were a considerable resource of the inland lakes before the dams impeded their migration from the sea. There are only five tuna records, all in the Cardrona and none since 1992. Landowners (pers. comm) in the catchment had not recalled seeing longfin since 1999, when a large November flood event brought on by northwest rains had flushed them down the catchment. Subsequent to this there have been few upstream migrants and only a single transfer of approximately 10, 000 juveniles into Lake Hawea in 1998.²⁵ There are two records of freshwater **koura** (Figure 11).

²⁵ Beentjes, MP. 1998. Enhancement of Lake Hawea eel stocks by transfer of juveniles. NIWA Technical Report 41. 15p.

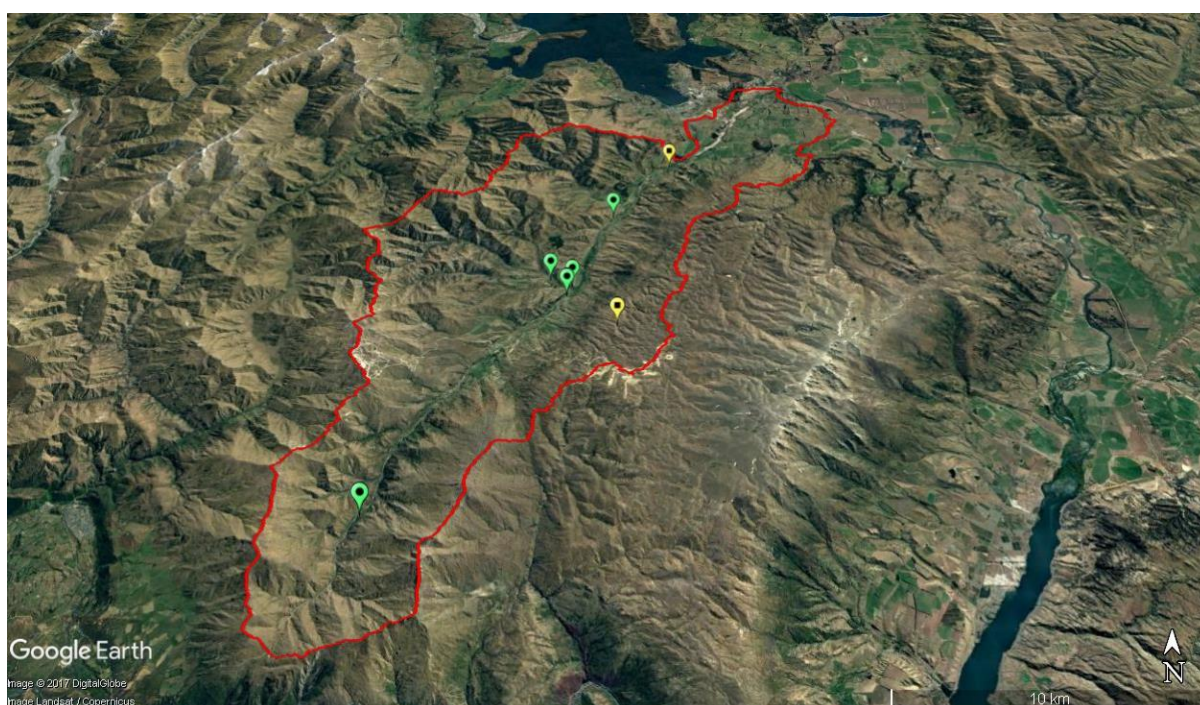


Figure 11. The Cardrona catchment (red) and New Zealand Freshwater Fish Database records for longfin (green) and koura (yellow).

Residual **wetlands** are important hydrological features. The wetland areas in the Upper Cardrona sit within the Pisa Conservation Area²⁶ which consists of 23,000 ha of top country in the Pisa Range (Figure 12). There is protection of wetland areas in the Arrow catchment through QEII covenants on the Motatapu, Mount Soho, Glencoe and Coronet Peak stations, with 53,000 hectares of continuous high country permanently protected on the Crown Range through the Motutapu and Soho Rivers.²⁷ There **are planting programmes** on river margins, **fenced off waterways**, wetlands, **tussocklands** and **shrubland** areas with retirement of almost all previously farmed areas with the exception of valley floors that can sustain sheep grazing.²⁸

²⁶ <http://www.doc.govt.nz/parks-and-recreation/places-to-go/otago/places/pisa-conservation-area/>

²⁷ http://www.openspace.org.nz/Site/About_QEII/News/Mahu_Whenua_covenants_opening_celebrated.aspx

²⁸ <http://www.stuff.co.nz/environment/10350045/South-Island-land-gets-lifelong-protection>

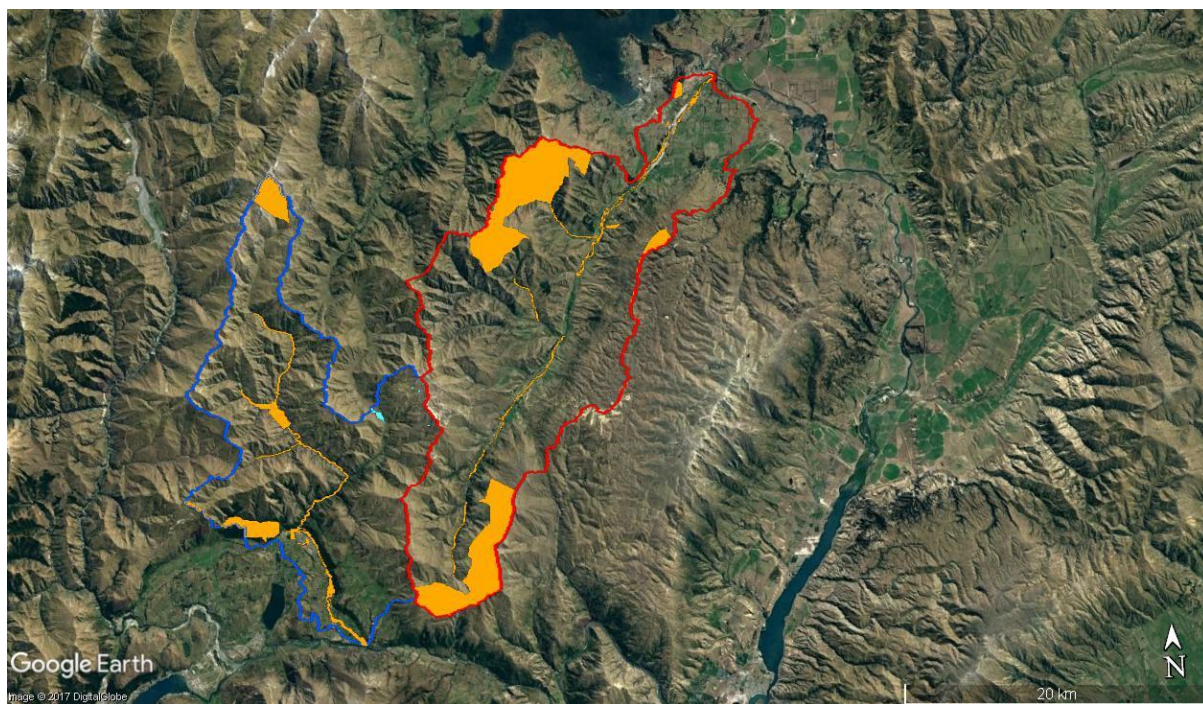


Figure 12. Protected Crown Land (orange) and significant wetland areas (light blue).

6 Values and Aspirations for the Arrow and Cardrona catchments

This chapter sets out the findings of interviews with the key informants about their connection with the Arrow and Cardrona rivers, and the observations made by whānau on the site visit.

6.1 Arrow River and Wakatipu Basin Aquifers

Water Quality

The value of the clear water in the Arrow, which is connected to the amount of water in the river, was expressed by Key Informant A. She values the clean, clear water she accesses via the Arrow Irrigation Scheme.

We turn off the pumps if there's been a big rainfall, it goes very dirty then, but generally it's clear. I like the good clean water, as it should be...When it's down, it could be about foot deep, but it's still very clear. If it went lower - it would be a problem. If more water was extracted it wouldn't be good. It would concern me if it went lower.

Site visit participants expressed concern about the water quality in the Wakatipu Basin aquifers. They also expressed disquiet about the fertilisers applied by the two major golf courses, Millbrook and The Hills, ending up in the run-off and going back into the aquifers.

The golf courses concern me because the Arrow Irrigation Company were talking about the run off going back down into the water table. The intensive management of golf courses, what they're putting on the grass - the state of that water going into the table is not good at all. It's full of chemicals.

These comments are consistent with the values expressed in the Kāi Tahu ki Otago and Murihiku iwi management plans²⁹ for water quality (Appendix 2), and have a direct connection to the quantity of water in the rivers and aquifers.

Recreational Use

Key Informant A values the Arrow to take her granddaughter for walks.

The river's on our doorstep so we don't go often, but I do take my granddaughter sometimes, down between Arrowtown and the junction. We go and have a look to see if we can see a fish... I think older people probably value the river more than the younger ones. They're probably too busy doing other things.

²⁹ Kāi Tahu ki Otago Natural Resource Management Plan (2005) and Te Tangi a Tauira- Ngāi Tahu ki Murihiku Natural Resource and Environmental Iwi Management Plan (2008)

Biodiversity Values

Whānau members on the site visit made observations about biodiversity in the wetlands of the Wakatipu Basin.

There were several small wetlands that appeared to need riparian fencing and restoration.

At the Arrow pedestrian bridge, whānau observed that there were poplars and willows that needed to be controlled and noted that the Arrow “is largely devoid of fish, except trout.” One site visit participant queried whether translocation of Upper Clutha galaxias may be possible, and noted the low numbers of trout in the river.

These comments are consistent with the values expressed in the Kāi Tahu and Murihiku iwi management plans for biodiversity (Appendix 1).

Landscape Values

One whānau member on the site visit commented on the weeds in the river:

I don't like seeing all the weeds and the grass growing in the river. At the Arrow at Arrowtown, there's potential to enhance the aesthetics, do some habitat restoration, get rid of some of the grass and weeds. That's the natural environment that our tūpuna would have seen, in a more natural kind of state. That does reflect our values. We understand the relationship of or the interconnectedness of the different elements of the natural environment. I'd like to see the integrity of the landscapes restored a bit more.

Values included allowing the river to function in its natural state.

Just let it be a river.

These comments are consistent with the values expressed in the Kāi Tahu and Murihiku iwi management plans for cultural landscapes (see Appendix 1).

Water Quantity

Whānau on the site visit made comments about observing “good flows” in Bush Creek and Mill Creek. The amount of water abstracted from the Wakatipu Basin aquifers was seen as very significant.

This is a highly modified catchment, with two significant golf courses. Together these are using more than 2 million litres of water per night in the drier months.

One felt abstraction from aquifers was going too far.

I'm not comfortable with the idea of taking water from aquifers. There's a relationship with everything. Water comes out of the ground when it's ready to. If we think of the landscape as papatūānuku, it's like stealing water from the womb, it's not quite ready...

Further values regarding aquifers and rivers are expressed in the Kāi Tahu ki Otago and Murihiku iwi management plans (see Appendix 1).

6.2 Cardrona River

Values expressed by whānau on the site visit and key informants included mahika kai, biodiversity, recreational use, and whānau connections. Concerns were expressed about water quality and quantity and loss of access, all of which have forced whānau to change how they use the river.

Mahika Kai

Key Informants B and C have lived in Wanaka for almost 50 years. The couple spoke of their lifestyle of hunting, fishing and exploring, embracing Wanaka's natural landscape. The mahika kai lifestyle is very much alive and well in this whānau.

"We're both Ngāi Tahu. We've raised our kids here. Our family are great fishermen, we've even used the lake. It's been a source of kai for our family for the years we've been here. Our family is really into hunting – everywhere really, pig and deer hunting, and we do a lot of fishing. Our kids take the grandchildren out hunting. One is hunting every weekend. Another daughter's got two wee ones, and one goes out with his father with the pig dogs

This whānau, and another key informant who had grown up in Albert Town (D), did not use the Cardrona River for fishing or eeling when they were young. However, whānau members on the site visit expressed their desire for the reintroduction of tuna (longfin eel), once downstream passage over the dams can be secured.

It really stands out to me that eel are missing from the Cardrona. (Site visit observation)

I would like eel to be reintroduced to the Arrow and Cardrona when downstream passage is secured. (Site visit observation)

I don't remember fishing in the Cardrona when we were young. The Hawea and Mata-Au are better for fishing. I've never seen any tuna there. If we were going to go eeling we'd go to the Mata-Au or the Hawea. (Key Informant D)

Biodiversity

The Upper Clutha flathead galaxias were of particular concern for whānau on the site visit.

I'm really concerned about the Clutha non-migratory galaxids and their possible extinction. It's really important. It's a native fish. That's got to make it important in itself.

It stands out to me that Upper Clutha flathead galaxias are critically threatened in the catchment.

Flatheads in the Cardrona are being pushed further and further up the catchment.



Figure 13: ORC scientist Pete Ravenscroft electric fishing for Clutha Flathead galaxias in the upper Cardrona.



Figure 14: A Clutha Flathead galaxia found in Roadman's Gully, upper Cardrona catchment.

Whānau observed the impact of weeds and having less water in the river on biodiversity.

The bottom of the Cardrona is in a weed-infested state and flows are related to that. Once it would've been a breeding area for terns and black billed gulls. There would've been native breeding river birds in that area that are no longer, and this is related to flow. It's a biodiversity issue for us. (Site visit observation)

The lower Cardrona is thick with woody weeds. This will have removed the potential for breeding of black-billed gulls, dottrel and black fronted terns. (Site visit observation)

When the channels get embedded you lose the lateral movement in the bed which is important for keeping the bed clear. We need to be aware that this is reducing the biodiversity value in the river. (Site visit observation)

There used to be heaps of water in the Cardrona and there used to be heaps more fish in the river. Every time we crossed it we'd see fish going up there. There's the odd fish now but not as many because it's way drier than it has been. Especially if we've had a dry summer. I haven't fished in the Cardrona as it's not a big river. Some fly fishermen would get into that sort of river though. (Key Informant C).

Whānau identified the potential to enhance with natives.

Native alternatives for river bank management need to be phased in over time. (Site visit observation)

The local farmers are noting change in climate with not as much August snow, and precipitation falling as rain. This means that the amount of water available for slow release will see spring growth of native plants affected. The ability to store water in the Cardrona catchment is minimal and the stock food growing season will be reduced. There is likely to be an impact on native vegetation, it may be displaced by introduced pest species that are better suited to the change in climate. I think some modelling of climate related rain/snow fall change needs to be considered as part of the assessment. (Site visit observation).

These comments are consistent with the values expressed in the Kāi Tahu and Murihiku iwi management plans for makika kai and biodiversity (see Appendix 1).

Water Quantity

Three informants spoke of the reduction in water in the Cardrona.

Some days the river's hardly there. It doesn't flood often now. We haven't had a big flood for years anyway. In the summer the river disappears underground and it's dry all the way down, then it comes up again. It's always dried out since we've lived here. There are still wee pools but that will have got rid of a few fish. (Key Informant C)

I've noticed at times there's not a lot of water available to do the things we did when we were kids. Most summers it's getting like that. The river doesn't have swimming holes any more that I can see. We take the younger ones there, but we don't go there swimming. We use the Hawea River hole now. But my three sisters and I are more connected to the Cardrona than the Hawea River. If the river is totally depleted of water it's going into its reserves underground which isn't good. We can't just keep taking water, it's not good. It can't keep carrying on. (Key Informant D)

I would not want to see any more water taken out of the Cardrona. No more. NO. There's the potential for it to impact on the aesthetics. Our water is a taonga. We want to see our water flowing, healthy, we want native fish in our rivers. I feel we have to draw the line with the commodification of our water. (Site visit observation)

At least there's no dairy up there to pollute the river. That would not be good (Key Informant C).

Whānau members on the site visit commented on the drying reach of the river, below Mt Barker.

Seeing the dry riverbed would be a bit distressing. We always want to see water in our rivers. It is a reflection of abundance, that's what you think about when you see a river that's beautiful and clean, it's imprinted in our DNA, it was part of our survival, it contributes to our health and wellbeing. If you've got flow you've got an abundance of kai, of fish. (Site visit observation)

We want to see healthy rivers with plenty of water in them, I'd prefer to see a flood than a dry riverbed. (Site visit observation)

The dry reach provides a sports fish barrier. (Site visit observation)

Whānau Connection

Key Informant D grew up in Albert Town, farming near the Cardrona River. Her family returns to their home in Albert Town each summer, where her sister lives. She spoke of the immense connection her whānau felt for the Cardrona River.

We still have connections. We go back every summer and enjoy the area like when we were growing up. Growing up we hung out with [another Māori family] who farmed there. We had horses in a paddock that bordered onto the Cardrona. We had sheep and did the shearing and tailing. We had a lot to do with that landscape. We used to go down to the river every day during summer when we were growing up. It was a really safe river to swim in. Mum would take us. We'd go there as a community, as whānau in the weekends, to have picnics and barbecues. It was our playground. We'd go down past the turnoff by the pub at Albert Town and go right, off the main highway, from there all the way down to the mouth of the river. There were holes that were deep enough to swim in. We would take the lilos down. (Key Informant D).

My other connection to the Cardrona is through my father, who was a goldminder there in the 1980s. He did a decade of goldmining there. Three local men got together and did it. It's significant not only for the Chinese but also for Māori, because they also mined up there, and also lost their lives up there, Dad would find artefacts and bones up there. (Key Informant D).

The Cardrona is very treasured by us, it's a place we still want to go to. It's so important to us (Key Informant B).

I still feel very connected to that whenua and that awa, so when we're in Wanaka, we still go there once a week, walking, swimming, mountain biking around that area. (Key Informant D).

We really treasure our rivers. Our rivers are in need of our mokopuna, our whānau. The rivers will never not be used. (Key Informant B)

Recreational Use

All the informants spoke of their use of the Cardrona River for recreation, and how changes in the river had affected their ability to swim and play there. Informants B and C spoke of how the changes in the Cardrona River and the Lindis River, another river they used to frequent, had forced them to change where they swim and fish. Water quality and quantity had affected swimmability, and willow removal and gravel extraction had changed the bed.

We still go fishing and swimming - not so much in the Cardrona anymore because it's polluted, but we go up the Matukituki and round that way. All our grandchildren have swum in the Lindis, but there's not much water in there these days. We've all swum in the Lindis over the years and fished as well. There are not many fish in the Lindis but it was a beautiful place to go for family gatherings and picnics. In the summer time the kids go out there, they go to a waterhole. (Key Informant B).

There used to be a lot of trees along the Cardrona and they've pulled all those out. A lot of willows have been cleared so when they take them out the holes underneath get shallower, making the swimming holes shallower. Then the gravel would wash away down further, and a lot of gravel has been taken out. It lowers that end of the river, it must make the water go down quicker and would take more gravel down. (Key Informant C).

We used to go up to go swimming in the Cardrona, there were a few good swimming holes. The swimming hole we used wouldn't be there now because the river changes. Every time there's a flood it would get washed out and it changed. We used to go swimming up above Mt Barker, and have picnics, but you'd be hard pressed to find a decent hole to swim in these days. Maybe now after the rain, but you don't want to swim when the river's dirty. Nowadays we would just go to the lake. You wouldn't know where to go in the Cardrona nowadays, it's not the same. (Key Informant C).

Down the bottom of the Cardrona, it's like a dump site where people are dumping rubbish, we could do planting and have a pou there. That would change the face of it and encourage people to respect and value the place more because it did not look very nice. It was sad to see that particular part of the river. (Site visit observation)

The rivers are still used for swimming. But it's like the Lindis. There's not much water in the Lindis now to swim in. I wouldn't want to see any more water taken out of the Cardrona. The Lindis used to be a good river, it's not anymore. (Key Informant B)

Loss of Access

One informant spoke of the inaccessibility of the Cardrona River these days.

There are paddocks all the way up and down the river. There was a ford but it's closed now. They've put a bridge in, but it's a private bridge... The river used to be pretty accessible, now it's private unless you know the farmer, so you can't go wandering across there. (Key Informant C)

At Mt Barker there's very poor access, although it has a marginal strip. Access is prevented by willows. (Site visit observation)

Water Quality

Water quality was a prominent theme, especially pollution below the dump site and the high levels of sediment observed on the site visit.

The water quality is probably alright upstream but I wouldn't go below the dump down. There used to be an old Rabbit Board down near the dump, and from there down, the river's pretty polluted. Near the confluence there's a lot of pollution, all sorts of seepage. The Rabbit Board was next to the dump. You'd walk along there and see all the dirty seepage from the dump across the gravel there, dirty green slime. I would never live down there. That was 10 years ago.

I think the Cardrona is more impacted than the Arrow. Careful land use by the landowners is necessary to maintain their soils. I suspect they are very aware of this and are careful under current regimes of use. It was my impression from listening to [a farmer we met with] that she takes her farm management regime seriously. This however will not prevent stock trampling, and stock loafing areas that contribute sediment to runoff. (Site visit observation)

The water coming out of the Cardrona at the confluence was dirty and was carrying a large amount of sediment. (Site visit observation)

In a forested undisturbed catchment I would not expect the water to be this dirty. There was quite a high sediment loading. I know the river was up at around 10 cumecs and it was in a flush. Still, there are a lot of exposed soils in the catchment contributing to a dirty river in flushing flows. (Site visit observation)

The confluence of the Clutha with Hawea was just upstream. The Cardrona is then the second river catchment contributing to water quality in the upper Clutha below the lakes after Hawea. Its contribution of the health of water quality, with all of the old mining that has occurred over time, have contributed to the deposition of old fines and sediment to the Mata-Au river system. Prior to human settlement the valley would have been reasonably well forested with wetland sedges, harakeke and woodland species cloaking the valley resulting in a very low sediment loading. (Site visit observation)

Aspirations

Aspirations for the Cardrona River include recognition of the historical importance of the ara tawhito, maintaining the integrity of the landscape, restoring margins and access, and improving biodiversity.

I would like to see some kind of education or a story board to acknowledge the ara tawhito. It's acknowledging the Māori that were in that landscape. (Site visit observation)

I want my children, and grandchildren to experience the landscape. It's about maintaining the integrity of the landscape as much as possible. I want there to be opportunities for communities to engage in landscape restoration to enhance that landscape so it can be more like it was in the days of the tīpuna, and that includes flows and access to waterways. (Site visit observation)

I would like eel to be reintroduced to the Arrow and Cardrona when downstream passage is secured. (Site visit observation)

Some whānau mentioned their kaitiaki responsibilities. Kaitiakitaka requires the protection of Kāi Tahu values in the river, to ensure it is left in a good state.

Our role as kaitiaki is to ensure that we leave the environment in a better state for the generations that come after us. The role of protecting and enhancing the whenua, awa

and the species associated with them, is the responsibility of the entire community. (Site visit observation)

People want those places to be pristine for the future generations. This is kaitiakitaka. (Site visit observation)

We want to leave a river for our grandchildren that is clean, with a river bed clear of weeds, with good access and with plenty of good wetland habitat along the margins. (Site visit observation).

This section has illustrated the very broad range of values and aspirations for the Cardrona River. Objectives and policies for aquifers and rivers are expressed in the Kāi Tahu ki Otago and Murihiku iwi management plans (see an overview in Appendix 1).

7 Conclusion

The values expressed by the key informants and whānau members who visited the Cardrona and Arrow Rivers reflect the values and aspirations expressed in the Murihiku and Kāi Tahu ki Otago iwi management plans.

The value of tuna - despite its scarcity in these catchments currently - has been clearly expressed in this report. The places where tuna were harvested remain important to whānau. Kāi Tahu's distinctive culture and lifestyle in the southern half of the South Island included seasonal migrations inland to harvest and collect food and other resources. This practice is referred to as "mahika kai" and remains a cornerstone of the culture today. The unrelenting cultural imperative is to keep the mahika kai intact, to preserve its productivity and the diversity of species. Mahika kai encompasses the ability to access the resource, the site where gathering occurs, the act of gathering and using resources, and ensuring the good health of the resource for future generations. Whānau have clearly expressed their desire to see tuna restored to the Cardrona and Arrow catchments, and flows must be sufficient for this to occur, so that customary use can be reinstated.

The trails and resource gathering places of Kāi Tahu whānau were widespread throughout Otago. The seasonal travel and places of encampment ensured the depth of association and traditions were continuously renewed and transferred to succeeding generations. Whānau wish to maintain and strengthen these associations in the Cardrona and Arrow catchments. The landscape is imbued with stories, and the treasured traditional place names are descriptive of all aspects of the life and times of the people. Key informants spoke of treasuring the Arrow and Cardrona rivers for recreation and as places for whānau gatherings.

The Arrow and Cardrona Rivers are part of the Clutha/Mata-au River system which weaves its way through the unique landscape out to the sea. Water plays a significant role in Kāi Tahu spiritual beliefs and cultural traditions, and the condition of water is seen as a reflection of the health of Papatūānuku. The loss and degradation of this resource through pollution and extraction is a significant issue for Kāi Tahu whānau.

Habitats and the wider needs of mahika kai and taoka species need to be protected so that resources are healthy and abundant within the Arrow and Cardrona catchments. Indigenous plant and animal communities and the ecological processes that ensure their survival need to be

recognised and protected to restore and improve indigenous biodiversity. Whānau concern about the Upper Clutha non-migratory galaxids has been clearly expressed. Pest control would support indigenous biodiversity.

Access to the rivers has also been identified as an issue. The protection of remaining indigenous fish habitat can be supported by prohibiting the introduction of exotic species where they currently do not exist, supporting fish passage, and removing exotic species from waterways. There is also potential for the protection and enhancement of wetlands in the Wakatipu Basin.

Minimum flows considered adequate by Kāi Tahu support the healthy functioning of ecosystems, which provides for their cultural values and customs. This desire is enshrined in the Kāi Tahu proverb and tribal motto - “Mō tātou, ā mō kā uri ā muri ake nei - for us and for the generations that come after us”.

Appendix 1: Ngāi Tahu Places names in the Cardrona and Arrow catchments

Ngāi Tahu Places Names in the Cardrona catchment

Kahuika	Korero Summary: Kahuika is the junction of the Orau (Cardrona River) and Mata-au (Clutha River). Reference: Beattie Southern Stray Papers 1930: The Gore District; Andersen 1944:222.
Tewaiatakaia (Mt Iron)	Korero Summary: Tewaiatakaia is the Māori name for Mount Iron. Reference: Rawiri Te Maire 1898 Map; Taylor 1952:14.
Karuroro	Geographic Description: A mahinga kai site on the Orau (Cardrona) at Ballantyne Road. Korero Summary: Karuroro is a mahinga kai site located on the Orau (Cardrona). It is recorded that āruhe (fernroot), tuna (eels) and weka were gathered there. Reference: Taiaroa 1880:187_155; Beattie (MLLAF) 1945:41.
Orau (Cardrona River)	Korero Summary: Orau is the Māori name for the Cardrona River which flows into the Mata-au (Clutha River). Orau was recorded as a kāinga mahinga kai where tuna (eels), mahetau, e mara pora and weka were gathered. Reference: Taiaroa 1880:144_13; Rāwiri Te Maire in Roberts Southland Times Papers 1913: XX; Beattie Southern Stray Papers 1930: The Clutha River; Andersen 1942:126 & 222; Herries Beattie Map.
Ara Tawhito	An ara tawhito followed the Orau to the Mata-au.

Ngāi Tahu Place Names in the Arrow Catchment

Haehaenui (Arrow River)	Haehaenui (Arrow River) rises in the Harris Mountains and flows generally in a southern direction past Wai Whakaata (Lake Hayes) into the Kāwarau River. Reference: Beattie Southern Stray Papers 1930: Round about Wakatipu; Andersen 1942:222; Beattie (MLLAF) 1945:28.
Kā-muri-wai	Kā-muri-wai is the Māori name for the pākihi (flat land) situated at Haehaenui (Arrow River) in Central Otago that was known locally as Arrowtown Flat. Reference: Beattie Southern Stray Papers 1930: Round about Wakatipu;

	Beattie (MLLAF) 1945:28.
Wai Whakaata	Wai Whakaata (Lake Hayes) is a small lake situated near the junction of the Kimi-ākau (Shotover River) and Kawarau River in the Whakatipu wai-Māori region. Reference: Roberts 1910:52; Beattie Southern Stray Papers 1930: Round about Wakatipu; Beattie (MLLAF) 1945:28; Herries Beattie Map.

Ngāi Tahu place names in the Wakatipu Basin.

Wāhi Ingoa	Cultural Mapping Database
Puahuru	Korero Summary: Puahuru is the junction of the Kimi-akau (Shotover River) and the Kawarau River. Reference: Beattie Southern Stray Papers 1930: Round about Wakatipu; Beattie (MLLAF) 1945:28.
Wai Whakaata	Common Name: Lake Hayes Korero Summary: Wai Whakaata (Lake Hayes) is a small lake situated near the junction of the Kimi-ākau (Shotover River) and Kawarau River in the Whakatipu wai-Māori region. Reference: Roberts 1910:52; Beattie Southern Stray Papers 1930: Round about Wakatipu; Beattie (MLLAF) 1945:28; Herries Beattie Map.
Kā-muri-wai	Geographic Description: The flat land at Haehae-nui (Arrow River). Korero Summary: Kā-muri-wai is the Māori name for the pākihi (flat land) situated at Haehae-nui (Arrow River) in Central Otago that was known locally as Arrowtown Flat. Reference: Beattie Southern Stray Papers 1930: Round about Wakatipu; Beattie (MLLAF) 1945:28.
Haehaenui	Common Name: Arrow River Korero Summary: Haehaenui (Arrow River) rises in the Harris Mountains and flows generally in a southern direction pass Wai Whakaata (Lake Hayes) into the Kawarau River. Reference: Beattie Southern Stray Papers 1930: Round about Wakatipu; Andersen
Kawarau (River)	Korero Summary: The Kawarau River was a traditional travel route that provided direct access between Whakatipu wai- Māori (Lake Whakatipu) and the Mata-au (Clutha River). A natural rock bridge known as Pōtiki-whata-rumaki-nao once existed on the Kawarau, allowing people to cross the river. In the evidence gathered for the 1879 Smith Nairn Royal Commission of Inquiry into the Ngāi Tahu land claims, Ngāi Tahu kaumātua recorded Kawarau as a kāinga mahinga kai (food-gathering place) where

	weka, kākāpō, kea, and tuna (eel) were gathered. The river is now part of a hydro-electricity scheme, and has many strong currents and rapids. Reference: Te Huruhuru 1844 Map; Taiaroa 1880:144_11; Roberts 1910:52; Kurupohatu in Roberts Southland Times Papers 1914: XLIII; Beattie Southern Stray Papers 1930: The Clutha River; Andersen 1942:126.
Te Wai o Koroiko	Common Name: Roaring Meg Korero Summary: Te Wai o Koroiko is the Māori name for the Roaring Meg which flows into the Kawarau River. In the 1879 Smith-Nairn Commission, Ngāi Tahu kaumātua recorded Te Wai o Koroiko as a kāinga mahinga kai (food gathering settlement) where tuna (eels) and weka were gathered. Te Wai o Koroiko was also part of the old Māori travel route from the Kawarau River into the Ōrau River which was the trail linking the settlements in the Wānaka and Hāwea region with Whakatipu-wai-Māori (Lake Wakatipu). Reference: Taiaroa 1880:188_167; Beattie (MPO) 1944:28; Beattie (MLLAF) 1945:73.
Te Waireika	Common Name: Gentle Annie Creek Korero Summary: Te Waireika is the Māori name for Gentle Annie Creek which flows into the north bank of the Kawarau River. Te Waireika was the name of an old Waitaha tūpuna (ancestor). Te Waireika was part of the extensive network of kāinga nohoanga (settlements) and kāinga mahinga kai (food gathering places) located throughout the high country of Te Waipounamu. In the evidence gathered for the 1879 Smith-Nairn Commission, Ngāi Tahu kaumātua recorded Te Waireika as a kāinga mahinga kai where tuna (eels) and weka were gathered. Reference: Taiaroa 1880:188_168; Ngāi Tahu 1880 Map in Beattie (MPO) 1944:28.
Potiki-whata-rumaki-nao	Korero Summary: Potiki-whata-rumaki-nao is the name of the former natural bridge located on the Kawarau River. Reference: Kurupohatu in Roberts Southland Times Papers 1914: XLII; Herries Beattie Map.

Appendix 2: Relevant content from Kāi Tahu ki Otago and Te Tangi a

Tauira natural resource management plans

Kāi Tahu ki Otago Natural Resource Management Plan 2005

The Kāi Tahu ki Otago Natural Resource Management Plans (NRMP) 1995 and 2005 are the principal resource management planning documents for Kāi Tahu ki Otago. The kaupapa putake/central objective of the plans is 'Ki Uta ki Tai' (Mountains to the Sea), which reflects the holistic Kāi Tahu ki Otago philosophy of resource management across this cultural landscape. The objectives and policies set out in the plans give a clear indication of Kāi Tahu values in the catchment.

The NRMPs express Kāi Tahu ki Otago values, knowledge and perspectives on natural resource and environmental management issues and are an expression of kaitiakitanga. While the NRMPs are first and foremost planning documents to assist Kāi Tahu ki Otago in carrying out their kaitiaki roles and responsibilities, they are also intended to assist others in understanding Kāi Tahu values and policy.

The 2005 plan is divided into catchments, with specific provisions for the whole Otago area and for each catchment. The Arrow and Cardrona are located within the wider Mata-au catchment. This section summarises the relevant objectives and policies.

WAI MĀORI OBJECTIVES AND GENERAL POLICIES

The Wai Māori objectives in the Natural Resource Management Plans address matters surrounding the spiritual and cultural significance of water to Kāi Tahu ki Otago, and the supporting of Kāi Tahu customs and cultural values. The objectives touch on matters relating to the discharge of contaminants, flow regimes and on water quality standards.

Comment

For Kāi Tahu waterways are of the utmost importance. Kāi Tahu is concerned about water quantity and the surface groundwater interactions that provide a range of freshwater habitats. Cultural values could be affected for example by changes to flow regimes creating adverse effects on taonga species/indigenous species/displacement species and their habitats, or by low flows compromising the ability of Kāi Tahu to use waterways for recreation or for gathering mahika kai.

Kāi Tahu wish to see minimum flow levels and flow regimes that recognise and provide for their cultural values and relationships, and that support the healthy functioning of the full range of associated ecosystems.

WAI MĀORI POLICIES - DISCHARGES

The relevant Wai Māori Discharge policies in the Natural Resource Management Plan relate to identifying and mitigating non-source pollution, encouraging management plans for all discharge activities, and encouraging management plans for natural hazards, including flooding, where these may impact on Kāi Tahu values.

Comment

Kāi Tahu are very concerned about the effect of sedimentation on waterways in Otago. Increasing levels of sedimentation affect native fish, including taonga species such as waikōura, inanga, galaxids and eels. High levels of suspended sediment can have negative effects on native fish by adhering to gills, which affects respiration, and can cause death. Sediment can also reduce fishes' visual recognition of food sources, affecting their growth and reproductive success.

Sedimentation is known to diminish the interaction between the substrate and its associated microbial flora and flowing water that is an important mechanism for biochemical processes which contribute to nutrient attenuation. It reduces the interstitial spaces where freshwater invertebrates live and feed thereby reducing the life carry capacity of the stream.

During the construction of structures such as dams and races, or the extension of existing structures, there is significant potential for sedimentation to occur. Additional irrigation capacity could also increase the likelihood of sedimentation occurring from farming practices. If riparian margins are poorly managed, there is stock access to waterways, or irrigation is applied inefficiently, there is a risk of greater nutrient and sediment losses from farms, with resulting detrimental effects on water quality.

When soils are saturated, nitrogen can be readily exported out of the soil profile and into streams and rivers.

WAI MĀORI POLICIES – WATER EXTRACTIONS

The Wai Māori – Water Extraction policies in the Natural Resources Management Plan are concerned with water takes (amounts, metering and reporting), review of water takes, and the

length of water take consents.

Comment

Kāi Tahu have particular concerns about the impact of flow levels on native fish species. They would like to see comprehensive information about any flow regime and particularly how it would impact native/taonga species/displacement species. Taonga species could be affected by low river levels in the summer, and changing flow levels in the tributaries. The cumulative impact of the water takes is of concern.

Kāi Tahu are interested in any remaining populations of longfin eels in the affected waterways, and the extent to which fish passage is provided for. The impact of both water abstractions and the dams on fish passage is of interest. They prefer that effective fish screens are fitted to all pumps and race intakes.

Native galaxias that are resident in tributary streams may be protected from predatory trout. Kāi Tahu would like further information about the extent to which flows might further expose these populations to increased predation.

Kāi Tahu usually oppose the granting of water take consents for 35 years. Consistent with a precautionary approach, we prefer either a review clause or a reduced consent term.

WAI MĀORI POLICIES – IRRIGATION

The relevant policies relating to irrigation encourage the most efficient application methods, precautionary consent terms, discourage over watering and encourage dry farming practices where this is appropriate.

Comment

Kāi Tahu is supportive of irrigation systems that use the most efficient method of application. Flood irrigation, border dyke and contour techniques are less likely to be supported than spray irrigation techniques. Kāi Tahu is supportive of irrigation efficiencies and of mechanisms that account for fish passage, water quality and other impacts that affect their values.

WAI MĀORI POLICIES – LAND USE AND MANAGEMENT

These policies promote land uses that suit the type of land and climatic conditions, encourage the exclusion of stock from waterways, monitor the effect of agricultural activity on groundwater quality, encourage integrated riparian management, and oppose the use of chemicals and poisons near waterways.

Comment

Kāi Tahu support land uses that suit the type of land and climatic conditions. Kāi Tahu concerns centre on the cumulative effects of land use intensification on water quality, sedimentation and nutrient levels, among other issues.

Kāi Tahu encourage the exclusion of stock from waterways. Fencing of streams would exclude stock from creating tracks to streams, which then become a sediment source during higher river flows. Fencing would also allow riparian buffers to form, which would filter out pollutants entering waterways through the overland flow of excess water. In addition, stock grazing along water races has potential for contamination of the race water, much like riparian grazing. Kāi Tahu seek monitoring of the effect of stock and agricultural activity on groundwater quality.

WĀHI TAPU OBJECTIVES

These objectives are about protecting wāhi tapu in a culturally appropriate way, and ensuring Kāi Tahu have access to sites.

Comment

There are a number of wāhi tapu or wāhi tūpuna sites in the Arrow and Cardrona catchment and it is highly likely that more sites could be discovered. Kāi Tahu policies require sites are protected from inappropriate activities in a culturally appropriate manner, and that access to them is maintained.

CULTURAL LANDSCAPE OBJECTIVES

These objectives promote the protection of significant cultural landscapes from inappropriate use and development.

Comment

The Arrow and Cardrona catchments and Wakatipu Basin are valued cultural landscapes. Kāi Tahu policies require the protection of significant cultural landscapes from inappropriate use and development. We discourage the erection of structures, both temporary and permanent, in culturally significant landscapes, lakes, rivers or the coastal environment. Over-abstraction of water can result in degradation of streams' and rivers' natural values and character.

MAHIKA KAI AND BIODIVERSITY OBJECTIVES

These objectives promote protecting and managing the habitats and wider needs of species of importance to Kāi Tahu ki Otago, including mahika kai species and indigenous plant and animal communities.

Comment

Kāi Tahu policies state that indigenous plant and animal communities and the ecological processes that ensure their survival need to be recognised and protected to restore and improve indigenous biodiversity within the Otago region.

Kāi Tahu understands that recreational anglers may wish to see the increase of the trout population as part of any mitigation measures in these proposals. Kāi Tahu is concerned about the impact of increasing predatory trout populations on native fish species.

Kāi Tahu support flow regimes that maintain healthy functioning ecosystems. Decisions about the flow regimes are of significant interest. Kāi Tahu consider it critical that habitats and the wider needs of mahika kai, taoka species and other displacement species of importance to them are protected.

WAI MĀORI POLICIES IN THE CLUTHA/MATA-AU CATCHMENT

These policies specifically relate to the Clutha/Mata-Au Catchment, which the Arrow and Cardrona forms a part of.

Sediment and siltation: These policies discourage activities that increase the silt loading in waterways or reaches of waterways.

Land use: These encourage the adoption of sound environmental practices where land use intensification occurs and promote sustainable land use in the catchment.

Wāhi tapu: These policies require that wāhi tapu sites are protected from further loss or destruction, and require accidental discovery protocols to be in place for earth disturbance activities.

Mahika kai and biodiversity: This policy requires native fish ingress and egress past all dams and structures.

Te Tangi a Tauira- Ngāi Tahu ki Murihiku Natural Resource and Environmental Iwi Management Plan, 2008

The kaupapa of this plan is Ki Uta Ki Tai – From the Mountains to the Sea. It is a culturally based natural resource framework developed by and for Ngāi Tahu Whānui and has been identified and advocated as a key tool in assisting Ngāi Tahu achieve more meaningful rangatiratanga and kaitiakitanga in natural resource management. It is about an indigenous understanding of the environment that can be used to help address the wide range of issues rūnanga face with regards to environmental management. Ki Uta Ki Tai is based on the idea that if the realms of Tāwhirimātea (god of the winds), Tāne Mahuta (god of all living things), Papatūānuku (mother earth) and Tangaroa (god of the sea) are sustained, then the people will be sustained.

The kaupapa reflects the knowledge that resources are connected, from the mountains to the sea,

and must be managed as such. Furthermore the kaupapa reflects that we belong to the environment and are only borrowing the resources from our generations that are yet to come. It is considered our duty to leave the environment in as good or even better condition than received from our tūpuna. The historical practices were established by our tūpuna and must be passed on to ngā uri kei te heke mai, the generations to come.

The plan is divided into sections relating to the environment. The relevant objectives, issues and policies are summarised here.

Chapter, Page, Reference and section name	Summary of Issues and Policies
3.5 Te Rā a Takitimu Pp. 146-148, Ref 3.5.11: O Te Wai	Water is a taonga, or treasure of the people. It is the kaitiaki responsibility of tangata whenua to ensure that this taonga is available for future generations in as good as, if not better quality. Water has the spiritual qualities of mauri and wairua. The continued well-being of these qualities is dependent on the physical health of the water. Water is the lifeblood of Papatūānuku, and must be protected. We need to understand that we cannot live without water and that the effects on water quality have a cumulative effect on mahinga kai and other resources. Water is often seen as a commodity, and is thus subject to competing use demands. An understanding of the significance and value of water to Ngāi Tahu ki Murihiku and other stakeholders, is necessary to ensure that cultural and ecological values associated with water are recognised and provided for alongside consumptive uses.
PP 147-148 Ref 3.5.10: General Water Policy	Ngā Kaupapa The role of Ngāi Tahu ki Murihiku as kaitiaki of freshwater must be given effect to in freshwater policy, planning and management. Work with local authorities and other statutory agencies involved in freshwater management to ensure that cultural values and perspectives associated with freshwater management are reflected in statutory water plans, best practice guidelines and strategies, and in resource consent processes for activities involving water. Protect and enhance the mauri, or life supporting capacity, of freshwater resources throughout Murihiku. Manage our freshwater resources wisely, <i>mō tātou, ā, mō ngā uri ā muri ake nei</i>, for all of us and the generations that follow. Promote the management of freshwater according to the principle of <i>ki uta ki tai</i>, and thus the flow of water from source to sea. Promote catchment management planning (<i>ki uta ki tai</i>), as a means to recognise and provide for the relationship between land and water.

	Ngāi Tahu's right to development, as per the Treaty of Waitangi, must be recognised and provided for with respect to future development and commercial activities in Fiordland, including the export of water. Protect and enhance the customary relationship of Ngāi Tahu ki Murihiku with freshwater resources.
P. 148 Ref 3.5.11: Rivers	Many of the waterways of the Southland plains have specific cultural associations. They are known for an abundance of mahinga kai, used for a specific purpose, or associated with a specific ceremony or ritual. Waterways may be considered wāhi tapu (i.e. associated with urupā or with an activity or occurrence considered tapu), or wāhi taonga (general site of cultural significance). The Ōreti, Waiau, Aparima, Matāura, Pomahaka and Mata-au/Clutha are Statutory Acknowledgement areas under the NTCSA 1998 (Schedules 50, 69, 15, 42, 52 and 40), providing for the special association of Ngāi Tahu with the rivers. The tūpuna had considerable knowledge of whakapapa, traditional trails and tauranga waka, places for gathering kai and other taonga, ways in which to use the resources of Southland rivers, the relationship of people with the river and their dependence on it, and tikanga for the proper and sustainable utilisation of resources. All of these values remain important to Ngāi Tahu ki Murihiku today.
P. 150	The following are indicators used by tangata whenua to assess stream health: • Shape of the river • Sediment in the water • Water quality in the catchment • Flow characteristics • Flow variations • Flood flows • Sound of flow • Movement of water • Fish are safe to eat • Uses of the river • Safe to gather plants • Indigenous vs. exotic species • Natural river mouth environment • Water quality • Abundance and diversity of species • Natural and extent of riparian vegetation • Use of river margin • Temperature

	• Catchment land use • Riverbank condition • Water is safe to drink • Clarity of the water • Is the name of the river an indicator?
P. 156	<u>Mata-au/ Clutha</u> Ngāi Tahu ki Murihiku cultural associations • The river takes its name from a Ngāi Tahu whakapapa that traces the genealogy of water. On that basis, Mata-au is seen as a descendent of the creation traditions • The Mata-au was part of a mahinga kai trail that led inland and was used by Ōtākou hapū • The river was used for the transportation of pounamu from inland areas down to the settlements on the coast. There were numerous tauranga waka along the river, as well as areas known for camping overnight and gathering kai. • The Mata-au is where Ngāi Tahu's leader, Te Hautapunui o Tū, established the boundary line between Ngāi Tahu and Ngāti Mamoe. However, eventually unions between the iwi overcame these boundaries. • Urupā and battle grounds located along the river • Battleground known as Te Kauae Whakatoro (downstream of Tuapeka) recalls a confrontation between Ngāti Māmoe and Ngāi Tahu that led to the armistice established by Te Hautapunui o Tū. • Cultural importance of three large lakes at the headwaters of the Mata-au: Lake Wakātipu, Lake Wānaka and Lake Hāwea Significant Resource Management Issues <i>Water quality</i> • Impacts on water quality from land use intensification <i>Dams and Diversions</i> • Dams on the river for power generation (e.g. Roxburgh Dam, Clyde Dam) – impacts on river health and disruption of continuity of flow (<i>ki uta ki tai</i>) • Impacts of hydro infrastructure on fish passage • Build up of gravels above the dam • Protection of natural variability and character of flow, and the habitats created by such flow • Flooding <i>Gravel extraction</i> • Gravel extractions in lower catchment areas – cumulative effects <i>Wāhi tapu</i> • Protection of culturally significant sites in the catchment
P. 157 Ref 3.5.12: Discharge	Discharges to water may be point source discharge (e.g. actual discharges to water), or non-point source discharge (e.g. from land to water). Activities that may involve

to Water	the discharge to water include sewage or industrial waste disposal. Such discharges may result in increased nutrient and contaminant loads, and thus degraded water quality. Indirect discharges such as contaminated stormwater run-off, agricultural run-off, and sedimentation also have the potential to adversely affect water quality.
pp. 157-158	Avoid the use of water as a receiving environment for the direct, or point source, discharge of contaminants. Even if the discharge is treated and therefore considered “clean”, it may still be culturally unacceptable. Generally, all discharge must first be to land. This general policy is a baseline or starting point. From this point, the Rūnanga can assess applications on a case by case basis. Assess discharge to water proposals on a case by case basis, with a focus on local circumstances and finding local solutions. Consider any proposed discharge activity in terms of the nature of the discharge, and the sensitivity of the receiving environment. When existing rights to discharge to water come up for renewal, they must be considered in terms of alternative discharge options. When assessing the alternatives to discharge to water, a range of values, including environmental, cultural and social, must be considered in addition to economic values. Encourage the establishment of wetland areas, where practical, as an alternative to the direct discharge to water. Discharge to a wetland area allows Papatūānuku the opportunity to filter and clean any impurities. Any discharge activity must include a robust monitoring programme that includes regular monitoring of the discharge and the potential effects on the receiving environment. Require robust monitoring of discharge permits, to detect non-compliance with consent conditions. Non-compliance must result in appropriate enforcement action to discourage further non-compliance. Promote the use of the Cultural Health Index (CHI)³⁰ as a tool to facilitate monitoring of stream health, and to provide long term data that can be used to assess river health over time. Ngāi Tahu ki Murihiku consider activities involving the discharge of contaminants to water a community issue. For this reason, ngā rūnanga may, where seen as appropriate, recommend that a consent application be notified.
pp. 158-159. Ref 3.5.13: Water Quality	Water is held in the highest esteem because the welfare of the life that it contains determines the welfare of the people reliant on those resources. Ensuring that water that is meant for drinking is of drinking water quality, and that water where mahinga kai is harvested is safe to eat from, and the water where our kids swim is safe for them to swim in, is our kaitiaki responsibly as Ngāi Tahu ki Murihiku. Water quality policies in this iwi management plan focus on improving water quality across the Rohe, and striving for the highest possible standards, whilst still being effective and practical.

³⁰ The Cultural Health Index Assessment is a tool developed to help Rūnanga quantitatively assess the health of waterways, and participate in the management of water resources. See Tipa, G. and Teirney, L. 2003.

PP. 158-159	Ngā Kaupapa The role of Ngāi Tahu ki Murihiku as tangata whenua and kaitiaki of water must be recognised and provided for in all water quality management. Strive for the highest possible standard of water quality that is characteristic of a particular place/waterway, recognising principles of achievability. This means that we strive for drinking water quality in water we once drank from, contact recreation in water we once used for bathing or swimming, water quality capable of sustaining healthy mahinga kai in waters we use for providing kai. Require cumulative effects assessments for any activity that may have adverse effects of water quality. Avoid compromising water quality as a result of water abstractions. Avoid the use of water as a receiving environment for the direct, or point source, discharge of contaminants. Generally, all discharge must first be to land. Avoid impacts on water as a result of inappropriate discharge to land activities. When assessing the effects of an activity on water quality, where the water source is in a degraded state, the effects should be measured against the condition that the water source should be, and not the existing condition of the water source (see text box on this page). Promote the restoration of wetlands and riparian areas as part of maintaining and improving water quality, due to the natural pollution abatement functions of such ecosystems. Require the use of buffer zones, riparian areas, bunds and other mechanisms to prevent stormwater and other wastewater from entering waterways. Water quality definitions, categories, and standards must be determined, measured, and assessed with cultural values and indicators alongside scientific information. Such indicators and values centre on the ability of the waterway to support life, and the fitness of water for cultural uses. Require robust monitoring of discharge permits, to detect non-compliance with consent conditions. Non-compliance must result in appropriate enforcement action to discourage further non-compliance.
PP. 160-161 Ref 3.5.14: Water Quantity- Abstractions	“Sustainable water use is about using what we need, not what we have.” Irrigation is a large consumptive use of water resources on the Southland Plains, and most water take resource consent applications that tangata whenua are consulted on are to provide water for farming operations (e.g. irrigation). Abstractions for such operations are largely groundwater sourced. Water is also abstracted and returned for hydropower generation, from rivers such as the Matāura, Matau-au/Clutha and Waiau. While over allocation of water is generally not an issue in Southland, Ngāi Tahu ki Murihiku believe that a precautionary approach is needed regarding the cumulative impact of takes, and the sustainability of water supply. Uncontrolled abstractions from both surface and groundwater sources can have adverse effects on water quality and quantity, and on the mauri of the water source. In areas such as

	Riversdale, kaitiaki rūnanga have already identified a risk to the groundwater resources as a result of the cumulative effects of groundwater takes in the area.
P. 164 Ref 3.5.16: Mahinga kai	Mahinga kai was, and is, central to the Ngāi Tahu ki Murihiku way of life. The collection and processing of mahinga kai is an important social and economic activity. Tangata whenua aspirations and expectations for mahinga kai are a common kaupapa throughout this plan. Mahinga kai is about mahi ngā kai – it is about places, ways of doing things, and resources that sustain the people. The loss of mahinga kai is attributed to habitat degradation, resource depletion, legislative barriers that impede access, changes in land tenure that affect ability to access resources and the introduction of predators that have severely reduced the traditional foods of Ngāi Tahu.
P. 165 Ref 3.5.17: Ngā Pononga a Tāne a Tangaroa	Tāne and Tangaroa are the two atua who are responsible for all living things in the environment, or biodiversity. The protection of indigenous biodiversity is an important value for Ngāi Tahu ki Murihiku. Indigenous species, and the habitats that support them, must be protected for future generations. In many parts of the takiwā, where land use is dominated by agriculture and forestry, the impact of human activity on indigenous species has been significant. An important focus for Ngāi Tahu ki Murihiku is finding ways to protect, maintain and improve habitat for all biodiversity, be it in water, riparian margins, native bush or wetlands.
P. 169 ref 3.5.21: Protection of significant sites	<u>Wāhi Tapu me Te Wāhi Taonga</u> Ensure that Ngāi Tahu ki Murihiku are able to effectively exercise their role as kaitiaki over wāhi tapu and wāhi taonga in Murihiku. Work with local authorities and other statutory agencies involved in the protection of cultural heritage to ensure that Ngāi Tahu perspectives and policies are reflected in statutory plans, best practice guidelines and strategies, and in resource consent processes (e.g. prohibited activity status for wāhi tapu areas). Maintain good working relationships with those agencies involved in the protection of historic and cultural resources in Murihiku. Develop and maintain effective working relationships with landowners and the wider community, with regards to the protection of, and access to, cultural and historic resources in the entire takiwā of Ngāi Tahu ki Murihiku. Avoid compromising unidentified, or unknown, sites of cultural significance as a consequence of ground disturbance associated with land use, subdivision and development. Ensure that oral history and customary knowledge is considered equally alongside documented evidence when determining the cultural heritage values of a region or site. Applications for activities in areas of cultural significance where there are no known sites but the likelihood of finding sites is high, will require one or more of the following (at the cost of the applicant): site visit;

	b. archaeological survey (walk over/test pitting), or a full archaeological description, by an archaeologist approved by Ngāi Tahu ki Murihiku c. archaeological authority; d. cultural impact assessment; e. cultural monitoring; f. accidental discovery protocol agreement. Where an archaeological survey is required to assess the cultural heritage values in an area, the archaeologist must have the mandate of the appropriate kaitiaki rūnanga. Any site that fulfils the criteria of the Historic Places Act 1993, whether recorded or not (it just has to be suspected), is protected under the Act. This refers to unexpected sites that may be uncovered during development, even after approval of the overall project has been consented to by tangata whenua. Ensure that resource consent applicants are aware that liaising with iwi on the cultural impacts of a development does not constitute an archaeological assessment. Any interpretation or portrayal of Ngāi Tahu history or associations with wāhi tapu or wāhi taonga is subject to policies for cultural interpretation, as per Section 3.3.9 of this Iwi Management Plan.
P. 170 ref 3.5.22 Wāhi ingoa	The strong Ngāi Tahu presence in Murihiku is evidenced in the wāhi ingoa, or place names, that remain on the landscape. These names record Ngāi Tahu history, and point to the landscape features that were significant to people for a range of reasons. Some of the names are visible on the landscape today; others remain only in customary knowledge base of tangata whenua.

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