BEFORE THE ENVIRONMENT COURT
I MUA I TE KOOTI TAIAO O AOTEAROA

Decision No. [2019] NZEnvC 166

IN THE MATTER	of the Resource Management Act 1991
AND	of Plan Change 5A to the Regional Plan Water for Otago
AND	of an appeal under clause 14 of the First Schedule of the Act
BETWEEN	LINDIS CATCHMENT GROUP INCORPORATED
	(ENV-2016-CHC-61)
	Appellant
AND	OTAGO REGIONAL COUNCIL
	Respondent

Court: Environment Judge J R Jackson
Environment Commissioner K A Edmonds
Environment Commissioner R M Bartlett

Hearing: at Wanaka on 5 to 9 November 2018 and at Cromwell on 12 to 16 November 2018 and on 28 to 30 January 2019
(Final submissions received 10 July 2019)

Appearances:
P J Page and B Irving for Lindis Catchment Group Incorporated as applicant
A J Logan and T Sefton for Otago Regional Council as respondent
M Baker-Galloway and G Cassidy for Otago Fish and Game Council and for Clutha Fisheries Trust as section 274 parties
M Sole for the Central Otago Environment Society Incorporated as a section 274 party
R O Boyd for the Upper Clutha Angling Club as a section 274 party
P Williams for the Department of Conservation as a section 274 party
The Hanan family as a section 274 party to the section 293 application
S E Keith as a section 274 party to the section 293 application

Date of Decision: 7 October 2019

Date of Issue: 7 October 2019

DECISION (RE PC5A TO THE OTAGO REGIONAL WATER PLAN)

A: Under section 290 Resource Management Act 1991, the Environment Court cancels the decision of the Otago Regional Council dated 13 August 2016 and directs that for the Lindis River:

- a minimum flow of 550 l/s at the Ardgour Flow Recorder; and
- a primary allocation of 1,640 l/s

must be inserted into the appropriate places in Schedules 2A and 2B of the Otago Regional Plan: Water.

B: Under section 293(1) of the Resource Management Act 1991 the Environment Court confirms that the following policy and rule should be added to the ORP:W:

Policy X

To maintain the life-supporting capacity and enhance the natural character of the mainstem of the Lindis River by ceasing to grant (or renew) any water permits for the take and use of water from the Lindis River by the Tarras Race (NZTM 2000 E1323951, N5030895), the Ardgour Race (NZTM 2000 E1324150, N5032696), the Point Race (NZTM 2000 E1322752, N5028693) and the Begg-Stacpoole Race (NZTM 2000 E1315078 N5023649).

Rule 12.0.1.5

The taking and use of water from the Lindis River by the Tarras Race (NZTM 2000 E1323951, N5030895), the Ardgour Race (NZTM 2000 E1324150, N5032696), the Point Race (NZTM 2000 E1322752 N5028693) and the Begg-Stacpoole Race (NZTM 2000 E1315078 N5023649) are prohibited activities, except as expressly allowed:

(a) by deemed permits WR1753CR.V2 and WR7787/96CR.V2 until they expire on 1 October 2021;

(b) for up to five (5) years from the commencement of any consent which may be granted under applications RM17.301.07 and RM17.301.09A (which are the subject of ENV-2018-CHC-155).

C: Leave is reserved for ten (10) working days for any party to apply to correct or amend orders A and B:

THE SEAL OF THE ENVIRONMENT COURT OF NEW ZEALAND

(1) to give better effect to the spirit and intent of the Reasons below or in the case of rule 12.0.1.5 to amend the rule to give effect to the Otago Regional Council's intentions in respect of the applications the subject of ENV-2018-CHC-155; and/or

(2) to add text in respect of secondary supplementary flows; and/or

(3) to make any consent orders in respect of other uncontested matters in Plan Change 5A.

D: Costs are reserved.

REASONS

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1 Introduction

1.1 Plan Change 5A and the issues

[1] This proceeding raises general questions which are likely to arise frequently over the next decade: first "when is water in a river over-allocated?" and second, depending on the answer to the previous question, "if the water in a river and connected groundwater is over-allocated, how should a regional council go about reducing the allocation of water takes (for uses such as irrigation)?".

[2] These questions arise in two proceedings relating to the water of the Lindis River in northern Otago. This decision resolves the first proceeding which is about a change to the regional water plan managing the Lindis River by setting a minimum flow

and "primary allocation" of water; the other proceeding (ENV-2018-CHC-155) is an application for a suite of water permits to take water from the river. That application is a direct referral under section 87G of the Resource Management Act 1991 ("the RMA" or "the Act") for which a separate interim decision ("the WPs decision") will be issued in the next few weeks.

[3] The Lindis River, which runs from headwaters near the Lindis Pass to the river's confluence with the Clutha River (Mata-Au) south of Tarras, is, like all other rivers and lakes in the Otago Region, managed under the operative Otago Regional Plan: Water for Otago ("the ORP:W"). The ORP:W, which came into force on 1 January 2004, can barely be said to make any effort to manage water volumes in many Otago catchments (including the Lindis River) because in most cases the primary allocation of water for irrigation is simply set as the sum of all existing water takes granted in the catchment. The primary allocation limit "set" in the ORP:W for the Lindis River in that way is 3,777 litres per second ("l/s"). There is no minimum flow for the Lindis River in the plan. (We will call this regime "the Status Quo option").

[4] The specific issues for this decision are, therefore, quite important. They are "what are the most appropriate minimum flow and primary allocation limits for the Lindis River to insert into Schedules 2A and 2B of the ORP:W?"

1.2 The notification, hearing and appeal on Plan Change 5A

[5] On 8 August 2015 the Otago Regional Council notified Plan Change 5A ("PC5A") to its Regional Plan: (the ORP:W). The purpose of PC5A was to set a management regime for the surface and groundwater resources of the Lindis catchment and the Bendigo-Tarras Basin. Amongst other things, PC5A, as notified, proposed a minimum flow of 750 l/s from 1 October to 31 May in the following year. It also proposed a primary allocation limit in Schedule 2A of the ORP:W of 1,000 l/s. Crudely, this would mean that up to 1,000 l/s could be allocated from the river provided the flow at a certain point in the lower river (the Ardgour flow recorder site) did not fall below 750 l/s.

[6] The Otago Regional Council ("ORC") received 81 submissions on PC5A. On 26 September 2015 the ORC released a summary of the decisions requested and called for further submissions. Six further submissions were received.

[7] Commissioners were appointed by the ORC to hear the submissions. After a site visit and a hearing, they released their decision ("the Commissioners' Decision") on 13 August 2016. They recommended[1]:

> Retain Proposed Plan Change 5A (Lindis: Integrated water management) subject to amendments as follows:
>
> - Amend in Schedule 2A of the Water Plan the proposed minimum flow for primary allocation for the period 1 October to 31 May for the Lindis Catchment to 900 l/s.
> - Amend in Schedule 2A of the Water Plan the primary allocation limit in Schedule 2A of the Water Plan to 1,200 l/s.
> - Clarify in Schedule 2B of the Water Plan the dates to which the supplementary minimum flows apply:
>   - 1 May to 30 November.
>   - 1 December to 30 April.
> - Remove from Schedule 4B.2 of the Water Plan the proposed restriction on irrigation takes from the Lower Tarras and Bendigo Aquifers.

We will call that flow regime option "the 900 MF option". It should be noted first that a minimum water flow of 900 l/s represents just over 50% of the mean annual low flow ("MALF") of the Lindis River and second that the minimum flow of 900 l/s was based on the assumption water would continue to be taken through existing water races.

[8] On 23 September 2016 the Lindis Catchment Group Incorporated ("LCG") appealed to the Environment Court on the grounds (*inter alia*) that PC5A does not provide for the economic viability or social wellbeing of the catchment's community. LCG sought a summer minimum flow of 450 l/s at the Ardgour flow monitoring site, a primary allocation limit of 1,900 l/s and other minor changes to the ORP:W. Subsequently the minimum low flow in this option was increased to 550 l/s and the primary allocation reduced to 1,640 l/s. We will call the LCG's amended relief "the 550 MF option".

[9] The obvious options for minimum flow and primary allocation figures before the court are therefore:

- the Status Quo option (that is, what is occurring at present);
- PC5A as notified;
- the 900 MF option (as in the Commissioners' Decision);

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1 Decisions of Council on Proposed Plan Change 5A p 1.

- the 550 MF option;
- a naturalised flow ("the NF option") with no water takes other than for domestic and stock water.

[10] The Status Quo option is largely for framing purposes because there is no appeal seeking a return to the status quo (which has no set minimum flow). The Status Quo option was referred to by witnesses to demonstrate changes that would result from the other options before the court. On the other end of a continuum of takes, a "naturalised" flow scenario was also put forward in the evidence. The scenario – the NF option – assumes all water (less 50 l/s for stockwater) that enters the river remains in it. In other words, there is no abstraction. It represents the pre-European flows of the river but with modified ecosystems due to the introduction of new species to its margins, bed, and water. We analyse these in more detail in subchapter 3.3.

1.3 The parties and their positions

[11] The Lindis Catchment Group represents almost all irrigators in the Lindis catchment.

[12] In addition to the appellant LCG and the respondent, the ORC, there are a number of section 274 parties. The Otago Fish and Game Council ("Fish and Game") is the principal supporter of the Commissioners' Decision and the 900 MF option.

[13] The Department of Conservation was involved in the proceeding as a section 274 party, principally to support native biodiversity. It was not overly concerned about which of the live options the court might adopt, so long as native biodiversity is protected.

[14] There are a number of section 274 parties (Cloudy Peak Pastoral Limited, Mr Bruce Jolly, Mr Tim Davis and the Point Partnership) supporting the LCG and ORC.

[15] The other section 274 parties who appeared at the hearing are the Central Otago Environment Society ("COES"), the Upper Clutha Angling Club and New Zealand Professional Fishing Guides Association. These parties are principally concerned with the effects on the trout fishery and on angling, and the effects of the water takes on the river's ecology.

[16] After mediation and expert conferencing of this appeal, it was placed on hold at the parties' request while the LCG applied for resource consents for a suite of permits to replace 34 existing individual consents to take water from the Lindis River. That application (ENV-2018-CHC-155) was referred directly to the Environment Court under section 87G of the RMA.

[17] At mediation in both proceedings the LCG and ORC reached agreement[2] on a primary allocation limit of 1,650 l/s, with a summer minimum flow of 550 l/s at the Ardgour flow recorder site, subject to:

(a) the closure of three major race intakes (the Tarras, Ardgour and Begg-Stacpoole Races);
(b) the replacement of three major race intakes by a system of "gallery takes" (i.e. takes from groundwater) downstream of the Ardgour Road bridge;
(c) LCG applying for consents for the gallery scheme; and
(d) LCG providing pulse flows of 1,000 l/s, if the flow at the Ardgour flow recorder is less than 700 l/s for 14 consecutive days.

[18] Other than the LCG and ORC's proposed allocation limit of 1,650 l/s and the minimum flow of 550 l/s, none of those operating conditions are proposed to be included in the ORP:W. Rather, the LCG and the ORC rely on conditions in the water permits to achieve those outcomes. The primary allocation limit has subsequently been proposed to be reduced to 1,639 l/s (which LCG and some witnesses rounded up to 1,640 l/s) to be consistent with the sum of the water permit takes applied for and recently granted. That regime is opposed by almost all of the section 274 parties.

[19] The proceeding and the direct referral were then heard together which has caused both benefits and disbenefits (some confusion) as we shall see. One point we should make immediately is that there are a number of local residents who are section 274 parties to the direct referral but not to this appeal. However, some of their evidence is relevant to the resolution of this proceeding so we have identified these persons and considered their evidence under section 276(1)(a) RMA at the appropriate parts of this decision.

[20] During the hearing the ORC made an application under section 293 RMA in this

2 ORC opening submissions [17] [Environment Court document 1].

proceeding, and we will refer to that at the appropriate point.

[21] As a final preliminary matter we note that because the PC5A was publicly notified in May 2015, the applicable version of the RMA includes all amendments up to and inclusive of the Resource Management Amendment Act 2013 (but does not include the extensive amendments made by the Resource Legislation Amendment Act 2017 "the RLAA 2017"). In contrast, the direct referral – the second proceeding – was lodged after the RLAA 2017 came into force. As it happens, nothing turns on the difference.

2 The Lindis River

2.1 The Lindis catchment and current hydrology

[22] The Lindis River rises in the vicinity of the Lindis Pass and flows generally south 55 kms from its high point at source (1,925 m above sea level) down to 220 MASL at its confluence with the Clutha River (Mata-Au). Its catchment is approximately 1,000 km^2.

[23] We will use the following descriptors for different reaches of the river:

"upper river"	the catchment from headwaters down to Elliotts Bridge (south-east of Lindis Peak and a few hundred metres downstream of the Lindis Peak Flow Recorder on SH8);
"Middle reach"	Elliotts Bridge (on SH8) to Ardgour Road bridge (approximately 3.5 kms by road east-south-east of Tarras);
"Ardgour reach"	Ardgour Road bridge to Tarras Crossing bridge (back at SH8);
"the Crossing reach"	Tarras Crossing bridge to the Clutha/Mata-Au;
"lower river"	comprises the Middle, Ardgour and the Crossing reaches together.

[24] Flow recorders ("FR") have been established at two places: near Lindis Peak and at Ardgour Road ("the Ardgour FR") (for over 40 years). The Ardgour FR site is approximately 3.7 kms from the confluence and is about 800 m upstream from the SH8 bridge over the river at Lindis Crossing. The Lindis Peak site is 31.8 kms upstream from the confluence and a few hundred metres upstream of Elliotts bridge (on SH8).

We annex, marked "X", a copy of part of a map (NZ Topo 250-26) showing the location of the lower river and tributaries such as Coal Creek and Cluden Stream in relation to Wanaka Cromwell and Alexandra. We also attach marked "A" a map[3] showing the Ardgour and the Crossing reaches of the river and some of the features referred to in the evidence.

[25] The approximate distance upstream from the Clutha/Mata-Au confluence of various points is shown in Table 2.1:

Table 2.1: Location of key sites on the Lindis River

Feature	Distance upstream (kilometres)
The Lindis Peak flow site	31.8
Elliotts Bridge (SH8)	31
The Tarras race Cluden Stream confluence and intake	23
The Ardgour Race intake	20.5
The Point Race intake[4]	17
The Ardgour Road bridge	11
The Ardgour FR site	3.7
Lindis Crossing bridge (SH8)	2

[26] From Lindis Pass, SH8 follows tributaries before first joining the Lindis River some kilometres downstream of its source. The tussock – or now more accurately tussock and hieracium – landscape near the pass is, of course, iconic in the modern sense. Further downstream the schist outcrops and tors on the dry hillsides above the willow-lined river are well known. All this stretch of the road is in the upper catchment. Except for the upper river's (very important) contribution to the flow of the Lindis River, we do not refer to it again.

[27] The Middle reach of the Lindis River starts where SH8 crosses from the east (true left) back to the west (true right) side of the river on a bridge ("Elliotts Bridge") about 31 kms north of the Clutha/Mata-Au. The road south then moves uphill and away from the river because the lower valley walls close in on the river. The two major off-takes for races occur at 23 kms (Tarras Race) and 20.5 kms (Ardgour Race) respectively (upstream).

3 D A Olsen evidence-in-chief Figure 2 [Environment Court document 12].

4 Called "Rutherford's" intake (wrongly) by some witnesses.

[28] Further south (downstream) The Point is named for a peninsula located at a distinctive change in landform. Immediately north of The Point the river emerges from its incised alignment and enters flats. The channel changes (briefly) from an incised small gorge channel above The Point to occasionally shifting braids within a wide gravel bed down to the Ardgour Road bridge. The wider river bed/ flood plain has been largely infested by lupins, and occasional willows can be found along the boundary of paddocks close to the river bed. The visual amenity of this reach is low, particularly in summer, with dried out algae found on the intermittently wetted channel and an overall less enclosed character of the banks. The drying of the channel also leads to odours that have a detrimental effect on the amenity of the reach.

[29] The southern end of this braided (losing) reach is approximately demarcated by the Ardgour Road bridge (which we have also chosen as the end of the Middle reach and the start of the Ardgour reach). From the bridge the river resumes as a single channel confined on the western side by the Bend Terrace, which separates the Ardgour valley from the wider Tarras Basin. This is a "gaining" reach where groundwater is forced back to the surface in the confined channel. Ardgour Road provides access to this part of the Lindis River, away from SH8 which Ardgour Road joins about 1 km north of Tarras. Ardgour Road crosses the river at the Ardgour bridge, then turns south and runs parallel to the river at a distance of several hundred metres to the east. The character of this part of the valley (Ardgour Road) is settled and rural with green irrigated flats and brown, much more extensively grazed slopes to the east (lower Dunstan Mountain slopes) and west (the Bend Terrace[5]). More residential dwellings are located along this stretch of river, on both sides of Ardgour Road, some being rural lifestyle blocks rather than large holdings.

[30] At the Ardgour FR there is a swimming hole with a rope tied to a willow above it. However, most of the river is shallow with numerous riffle/run sections. The weed didymo[6] is obviously visible. The reach below the Ardgour FR continues to follow the edge of The Bend Terrace as far as the SH8 bridge. Ardgour Road re-joins SH8 just to the south of the SH8 bridge. The character of the landscape and river change significantly at the bridge, where the valley – the Crossing reach – opens up into the wide fluvial plains of the much larger Clutha River/Mata-Au. The river's sinuous channel becomes slightly braided, opening up to wide gravel banks below the bridge.

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5 This is the plateau between the village of Tarras and the lower Lindis River.

6 *Didymosphenia geminata*.

The river bed displays characteristics of a braid-plain with extensive areas of gravel, most of which is infested by (introduced) lupins. Other weeds, such as introduced broom and briar, are also scattered across the gravel.

[31] Below the SH8 bridge, the river has often been dry. In recent years, due to the volume of abstraction, dried-out algae forms a white cover on the dry rocks, increasing the perception of low natural character relating to the flow and quality of the river bed in this area. The odours associated with the dry river bed also reduce the amenity along this reach.

[32] The river bed and immediate hinterland in the area on either side of the Crossing reach display low natural character with extensive weed infestation and numerous 4WD tracks on the southern side of the gravel banks. The SH8 bridge locally reduces the natural character, particularly when viewed from the popular car park immediately downstream on the southern side of the river. This reach holds the lowest natural character of any section of the river due to the reduced flows, algal cover and weed infestation of the gravel banks. The SH8 bridge is probably the most frequented viewpoint of the river, although the least scenic.

The current hydrology of the mainstem

[33] Rainfall is variable across the catchment, with large volumes of rain and snow falling in the steep hill country at the top of the catchment in winter and spring, while the lower part of the catchment is relatively dry. The strong seasonal pattern of rainfall variation sees low monthly mean river flows occurring between December and April with the lowest flows general between February and April. These correspond to the highest demand for irrigation water in the catchment.

[34] The naturalised flows are described in the following table[7]:

[7] R D Henderson evidence-in-chief Table 2 [Environment Court document 9].

Table 2.2 Catchment statistics at Lindis Peak [FR] and Ardgour Road [FR] (natural), derived from the NIWA and ORC flow records, with a date range of 1 October 1977 to 30 September 2017

Catchment	Catchment upstream of Lindis Peak FR	Catchment upstream of Ardgour Road FR	Catchment area between Lindis Peak and Ardgour Road FR
Catchment size (km^2)	551	973	422
Mean flow (l/s)	6074	7043	969
Runoff (mm/a)	348	228	72
Median flow (l/s)	4180	4779	—
7-Day Mean Annual Low Flow ("7-d MALF") (l/s)	1510	1750	240

[35] Those flow records demonstrate the higher contribution of the upper catchment to total catchment flow yield. Only 50% of the catchment lies above the Lindis Peak FR but this area contributes more than 80% of mean rainfall and of low flows as represented by the 7-day mean annual low flow ("7-day MALF"). Tributary flows in the lower catchment contribute a relatively small proportion of the catchment's flow yield. The 7-day MALF of 1,750 l/s at the Ardgour FR shows that the Lindis River is quite small in layperson's terms, less than six standard bath-tubs per second.

[36] From about 'The Point' – near Tarras – there is an aquifer located principally on the east (true left) side of the river. The volume of water in the river directly relates to groundwater in this aquifer – the Lindis Alluvial Ribbon Aquifer ("the ribbon aquifer"). Investigations have shown that there are two losing and two gaining reaches in the river (the gaining reaches are where groundwater increases surface flow)[8]. These are:

- upper-gaining reach – between Lindis Peak FR and The Point;
- upper losing reach – The Point to Ardgour Road bridge – losses to groundwater of 372 l/s[9];
- lower gaining reach of 320 l/s[10] – Ardgour Road bridge to Ardgour FR;
- lower losing reach – below Ardgour FR to Clutha confluence – losses to groundwater with an average of 450 l/s[11].

[37] As we shall see, the groundwater in the ribbon aquifer is treated as surface water in the ORP:W because of the connection between the water in the ribbon aquifer

8 B Cowie Section 87F Report [22] and [29] [Environment Court document 46].

9 J H Rekker evidence-in-chief [74(d] [Environment Court document 17].

10 J H Rekker evidence-in-chief [74(e)] [Environment Court document 17].

11 B Cowie section 87F Report [29D]: Losses to groundwater established and agreed at RCSA Joint Witness Conference B – refer Appendix B of Application at [1].

and the surface water in the river[12].

[38] During the irrigation season the losing reaches have sometimes run dry when flows were low because of the lack of rainfall and the volume of abstraction. Dewatering has also occurred elsewhere in the river in dry years. The significance of the losses to groundwater downstream of the Ardgour FR is that once the flow falls to 450 l/s at that point, there is a high probability that the river will dry out before it reaches the Clutha/Mata-Au confluence. Accordingly, the lower losing reach was the focus of much of the hydrological and ecological evidence in this case (particularly in relation to the ability to sustain habitat for trout over the summer months). The LCG proposal is designed to ensure that there is always a surface flow of 100 l/s in the Lindis river at the confluence.

Hydrology of the tributaries

[39] There are nine tributaries[13] of the Middle and Ardgour reaches from which water is taken[14]. These tributaries have very low natural flows[15]. This results in many of them running dry naturally[16]. Cluden Stream has a small flow (28 l/s) and water is visible in Waiwera Creek in those conditions[17]. The other streams have natural low flows of 10 l/s or less. The drying reaches mainly occur in the lower reaches of these streams where, due to the gravel substrate, flows are lost to groundwater.

[40] Surety of supply from the tributaries is relatively low[18] at 56%. Water takes are constrained by lack of water rather than by minimum flow. In most cases the water takes from tributaries are from the furthest downstream point of the naturally flowing reach. Seven of the streams dry naturally below the take and for these no residual flows are recommended. Residual flows for the other tributaries may be the subject of resource consent conditions when applications are made.

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12 Policy 6.4.1A ORP:W.

13 From north to south these are Rocky, Long Spur, Eight Mile, Nine Mile Creeks, Tim Burn, Coal Creek, Cluden Stream, Waiwera and Shepherd Creeks.

14 M A Hickey evidence-in-chief at [16]-[21] [Environment Court document 10].

15 Cluden Stream, the largest, has a seven-day MALF of 33 l/s.

16 M A Hickey, *Assessment of Effects on Instream Ecology due to Water Takes from Tributaries of the Lindis River*, September 2017.

17 M A Hickey evidence-in-chief Table 1 [Environment Court document 10].

18 R Henderson evidence-in-chief [55] [Environment Court document 9].

2.2 Water quality and ecological health

[41] Dr D A Olsen, an environmental scientist called by the LCG and ORC, reported[19] that water quality in the upper Lindis at present, is, under the Status Quo regime, generally very good, but in the lower reaches there are elevated concentrations of total nitrogen ("TN") and nitrate-nitrite nitrogen ("NNN"). All sites in the Lindis River met the water quality limits in Schedule 15 of the ORP:W for ammoniacal nitrogen, dissolved reactive phosphorus ("DRP"), *E. coli* and turbidity. Sites below Archies Flat (in the Middle reach) exceeded the limit for NNN. Long-term increasing trends in TN and NNN and a decreasing trend for DRP were detected at the Ardour Road FR, while a decreasing trend in *E coli* concentrations was found at Lindis Peak FR over the period 2003-2014. TN and NNN concentration at sites downstream of Archies Flat were markedly higher than at sites upstream and were considered likely to exceed the ORP:W's Schedule 15 limits. Dr Olsen attributed[20] this to the combination of higher-intensity land use in the lower part of the catchment, nitrogen-enriched groundwater entering the river, and decreased dilution of groundwater inputs as a result of abstraction of the higher-quality water coming from the upper catchment. As for tributaries, Dr Olsen noted[21] water quality in Cluden and Wainui Streams was generally good.

[42] One of the issues that has troubled us is the scant regard given to water quality. Whatever the outcome of this decision, any water permits granted in our second decision will be subject to review if water quality is not improved, especially in the river below the Ardgour Road bridge. The evidence[22] is that the 2025 target in the ORP:W[23] is unlikely to be met, since the limit is being breached now. One method (there are others which are often preferable but more expensive) of improving water quality is simply to dilute the pollutants, and that requires keeping more water in the river[24].

[43] Periphyton, a complex mix of various algae, diatoms, cyanobacteria and fungi, forms[25] the slimy coating on the surface of stones and other substrates in fresh water. Using photosynthesis, these organisms provide a source of energy to

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19 D A Olsen evidence-in-chief [62] [Environment Court document 12].
20 D A Olsen evidence-in-chief [18] [Environment Court document 12].
21 D A Olsen evidence-in-chief [66] [Environment Court document 12].
22 Transcript (2018) p 327 line 31 to p 328 line 8.
23 Schedule 15 ORP:W.
24 Transcript (2018) p 331 line 1 to p 332 line 6.
25 D A Olsen evidence-in-chief [75] et ff [Environment Court document 12].

macroinvertebrates that feed on them and form the basis of food webs which nourish all other organisms in the stream. However, when there are too many nutrients the organisms can form nuisance blooms that affect instream values such as biodiversity aesthetics, swimming and angling, irrigation takes and water quality. Some cyanobacteria produce toxins that pose a health risk to humans and animal. These include *Phormidium* and *Oscillatoria* which have been recorded from the Lindis River.

[44] Dr Olsen said that monitoring carried out in the Lindis River in 2014-15 indicates that the periphyton community at Lindis Peak FR under current flow patterns is consistent with a low level of nutrient enrichment and/or regular flushing flows. At the Ardgour FR long green filamentous algae dominate the periphyton community, indicative of elevated nutrient levels and/or low, stable flows. The invasive diatom didymo has dominated this site since 2007.

[45] In relation to macroinvertebrates, surveys undertaken in October 2014 by Dr Olsen indicated that macroinvertebrate communities in the Lindis River were consistent with good water quality with a low level of nutrient enrichment[26]. A repeat survey in February 2015 indicated that while water quality in the upper river was very good, in the lower reaches the combination of low, stable flows, presence of didymo, and/or poorer water quality or habitat quality resulted in macroinvertebrate communities that are indicative of fair or good water quality. Dr Olsen considered it unlikely[27] that many macroinvertebrates would survive during summer because of the length of time the river bed stays dry and the approximately 1 m depth to the water table. These reaches would be re-populated by invertebrates drifting back into the area from upstream, or by egg-laying of adult insects once flows in river bed resume. Under a natural state Dr Olsen expects macroinvertebrate communities to be similar to those in the upper river, with dominance of the common mayfly *Deleatidium* as well as other taxa that are intolerant of organic pollution. In the lower river, where waters are warmer and there is a higher periphyton biomass, he expects a greater presence of more pollution-tolerant species such as chironomid midges and snails.

[46] We received evidence from an abundance of ecologists. They and their abbreviations as used in some of the evidence referred to in Chapter 6 are:

26 D A Olsen evidence-in-chief [92]-[93] [Environment Court document 12].
27 D A Olsen evidence-in-chief [93] [Environment Court document 12].

For LCG and ORC	Dr D A Olsen as mentioned ("DO")
	Dr I G Jowett (ecology/hydrology) ("IJ")
	Dr G I Ryder (ecology/zoology) ("GR")
	Mr M A Hickey (ecology) ("MH")
	Dr M D Sanders (avian ecology)
For Fish and Game	Mr N R N Watson (ecology)
	Mr M J Trotter (ecology/zoology)
	Mr R M Gabrielsson (ecology) ("RG")
	Dr J W Hayes (ecology) ("JH")
	Mr P van Klink (avian ecology)
	Mr A Horrell (ecology)
	Dr G P Closs (ecology) ("GC")
For DOC	Mr D C Jack (ecology tributaries) ("DJ")
	Dr N R Dunn (ecology tributaries) ("ND")

[47] All the ecologists agreed[28] with the freshwater ecological values and description of periphyton and invertebrates in Dr Olsen's evidence.

2.3 The fish of the Lindis River

Native fish

[48] Five species of native fish have been recorded in the Lindis catchment. These are longfin eel (*Anguilla dieffenbachii*), koaro (*Galaxias brevipinnus*), Clutha flathead galaxias (*Galaxias* sp. D), common bully (*Gobiomorphus cotidianus*) and upland bully (*Gobiomorphus breviceps*). Dr Olsen's evidence[29] provided the following (agreed) information on these species:

> Longfin eels have been recorded from throughout the Lindis mainstem, Cluden Stream and the Pass Burn. Longfin eels are classified as "declining" under the New Zealand Threat Classification System. Longfin eels migrate from the ocean as juveniles and move upriver where the adults live for several decades before out-migrating to sea to spawn. However, the construction of the Roxburgh dam in 1956 prevented the upstream migration of juvenile eels, and this has been further impeded by construction of the Clyde Dam. Contact Energy ([which] own[s] the dams on the Clutha River/Mata-Au) undertakes some

28 Joint Witness Statement – Ecology (Mainstem), 18 and 19 October 2018 at [4] [Exhibit 10.5].

29 D A Olsen evidence-in-chief [37]-[41] [Environment Court document 12].

trapping and translocation of elvers (young eels) to the upper catchment, but the biomass and numbers of fish translocated (0.1-36 kg per annum) is low given the size of the Clutha catchment. Few of these fish are likely to dwell in the Lindis given the very large size of the upper Clutha catchment, and the presence of large lakes, including highly productive Lake Dunstan, above the Clyde Dam.

Koaro are widespread throughout New Zealand but are also classified as "declining" under the New Zealand Threat Classification System. Koaro are one of the species of whitebait, with their larvae being washed to sea shortly after hatching, returning to freshwater months later. However, koaro are exceptional climbers, being able to negotiate vertical waterfalls, meaning that they are able to penetrate very long distances inland. In addition, koaro form land-locked populations, with larvae using large lakes for juvenile rearing, before returning as whitebait to tributary streams in late autumn. Koaro have been found in the Lindis catchment, and koaro whitebait have been observed at the mouth of the Lindis but were unable to enter the Lindis due to the lower reaches being dry.

Clutha flathead galaxias, found only in tributaries of the Clutha above the Benger Burn, is classified as "nationally critical", the highest threat classification under the New Zealand Threat Classification System. In the Lindis catchment, the range of Clutha flathead galaxias has declined to now be mostly confined to tributaries upstream of water takes, mostly as a consequence of predation by trout (I.e., the species are rarely found to co-occur), although they can also be adversely affected by interactions with the native, migratory galaxiid, koaro.

Both species of bully found in the Lindis catchment (common and upland bullies) are common and widespread in New Zealand and are classified as "not threatened" under the New Zealand Threat Classification System. Common bullies are typically diadromous[30] and most populations are found close to the coast. However, land-locked populations are found in association with lakes throughout New Zealand and the population common bullies in the Lindis River is associated with Lake Dunstan. Upland bullies are widespread in the Lindis catchment.

[most footnotes omitted]

[49] The evidence of the ecologists provided little information about native fish in the main stem of the Lindis, although it was noted that flow conditions allowing juvenile trout to pass through the river would also allow native fish movement. Dr Jowett noted the distribution of Clutha flathead galaxid is severely restricted by the presence of trout under all scenarios. Another ecologist called by LCG/ORC, Mr Hickey, added[31]:

30 Diadromous fish regularly migrate between salt and fresh waters.

31 M A Hickey evidence-in-chief [20] [Environment Court document 10].

> Only two populations of Clutha flathead galaxiids in the Lindis appear to be free from competition with trout (Short Spur Creek and Big Spur Creek).

Dr Jowett did not consider it practical to manage flows such that trout would be excluded from the river to protect the Clutha flathead galaxiids.

[50] Two streams naturally flow permanently and connect to the Lindis River. These are Cluden Stream where a 5 l/s residual flow was recommended, and Waiwera Creek where a visible surface flow was to be maintained at two places on the stream. Mr Hickey said year-round residual flows "to protect the existing [ecological] values"[32] have been recommended.

[51] Longfin eels are rare throughout the catchment, even in tributaries with continuous flow and ample eel habitat. This is considered to be due to a lack of elvers passing through the Roxburgh and Clyde Dams on the Clutha River.

Clutha flathead galaxias

[52] Mr Jack's evidence focussed on Clutha flathead galaxias, longfin eel and koaro, as these are the fish species of highest conservation concern. He described[33] the variety of habitat occupied by the Clutha flathead galaxid, which includes riffles and pools in small gravelly, clear streams, between steep boulder cascades, in low gradient slow-flowing meandering channels of wetlands and in weedy pastoral creeks. He said[34] the New Zealand Non-Migratory Galaxiid Fishes Recovery Plan (DOC 2004) set out objectives to identify, protect and manage a minimum of 30 habitats per species with key non-migratory fish populations. Surveys in the Lindis catchment identified Clutha flathead galaxias in Coal Creek, Tim Burn and Short Spur Creek as three such habitats. As a result the Chain Hills Covenant, the Coal Creek and Short Spur Creek Conservation Areas were established to protect riparian areas of Coal and Short Spur Creeks.

[53] Mr Jack[35] explained that the Lindis River catchment has been analysed as having 19 independent "habitat fragments". These have been built into a management

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32 M A Hickey rebuttal evidence [155] [Environment Court document 10A].
33 D C Jack evidence-in-chief [25] [Environment Court document 42].
34 D C Jack evidence-in-chief [27] [Environment Court document 42].
35 D C Jack evidence-in-chief [31]-[33] [Environment Court document 42].

framework in an attempt to ensure persistence of the species. These habitats were surveyed over a period between 2002 and 2018. Between 2012 and 2018 Clutha flathead galaxias became locally extinct in four of the habitat fragments.

[54] Dr Dunn's evidence[36] for DOC contextualised the Lindis catchment Clutha flathead galaxias populations. These populations – together with others in the Cardrona River and Bannock Burn – are within an Upper Clutha Evolutionary Significant Unit ("ESU"). There is a second ESU encompassing a Manuherikia River tributary to the east. Dr Dunn's descriptions of Clutha flathead galaxias were confined to the Upper Clutha ESU. He said the conservation status of 'Nationally Critical' is based on an ongoing predicted decline of >70% in the total population due to existing threats, which he identified as the proximity of trout, water abstraction and agricultural intensification.

[55] Based on an analysis of literature and databases Dr Dunn identified[37] 42 habitat fragments of the species in the Upper Clutha ESU. The Lindis River contains the 19 previously mentioned (in four of which the species is now believed to be locally extinct). The Lindis catchment population was considered by Dr Dunn to be highly important for the persistence of the species. In relation to the influence of hydrology on the life cycle of the Clutha flathead galaxias, Dr Dunn[38] explained that the species' peak spawning and larval rearing period is in spring, between 1 August and 15 November. The hydrological environment can affect the availability and structure of spawning locations and can moderate cues for spawning such as water temperature.

Sports fish

[56] Two introduced species of sports fish are found in the Lindis River: brown trout (*Salmo trutta*) and rainbow trout (*Onchorynchos mykiss*). Brown trout are throughout the Lindis catchment whereas rainbow trout are largely found in the mainstem and the lower reaches of Cluden Stream[39]. The Lindis is a spawning tributary of the Lake Dunstan fishery. The Lindis River supports a local fishery and contributes recruits to the fisheries of the upper Clutha River and Lake Dunstan. Angler effort recorded in the

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36 N R Dunn evidence-in-chief [18]-[25] [Environment Court document 43].
37 N R Dunn evidence-in-chief [24] [Environment Court document 43].
38 N R Dunn evidence-in-chief [38]-[47] [Environment Court document 43].
39 N R Dunn evidence-in-chief [42] [Environment Court document 43].

three National Angler Surveys described[40] by Dr Olsen was relatively consistent, although the effort recorded in the most recent survey was lower than in the previous survey probably due to the very low river flows that summer. No fishing by overseas anglers was recorded in the 2014/15 angling season: "the only survey when fishery usage by overseas anglers was … considered"[41].

[57] Lake Dunstan and the Upper Clutha River are apparently regarded as "nationally important trout fisher[ies]"[42]. What that means is unclear: it seems to mean that a large amount of angling effort is expended on the lake[43]. Ms Baker-Galloway submitted that the Lindis River and some of its tributaries support that fishery by providing "… significant spawning and rearing facilities for brown and rainbow trout …"[44]. There is little evidence for their significance but, as we will see, ORP:W described[45] the river as having significant fish spawning areas and juvenile habitat and a "significant presence" of trout. As Dr Hayes conceded in cross-examination, those values have been maintained even though in dry years under the Status Quo the Lindis River has dried out in places.

[58] To put angling in the Lindis River into perspective, a survey in 2014/15 recorded[46] a total of 186,570 angler days on all the rivers and lakes of the Otago Region. Of the total fishing days (5,210) 2.6% in the region were by overseas anglers, and the vast majority (77%) were from Otago.

[59] Of course, the presence of trout is not benign for their food species. While of all the Lindis tributaries, Cluden Stream stands out as a high value trout spawning and rearing stream, it is exceptional in that Clutha flathead galaxias do not occur below any of the existing takes other than Cluden Stream. As we have recorded, only in Short Spur Creek and Long Spur Creek are the galaxids free from competition with and predation by trout.

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40 D A Olsen evidence-in-chief p 12, Table 1: Angler effort on the Lindis based on the National Angler Survey.

41 D A Olsen evidence-in-chief [43] [Environment Court document 12].

42 J W Hayes evidence-in-chief [135] [Environment Court document 15].

43 R O Boyd evidence-in-chief] [Environment Court document 37] N R N Watson evidence-in-chief [Environment Court document 38].

44 Fish and Game closing submissions [84] [Environment Court document 59].

45 Schedule 1A ORP:W.

46 Unwin M J Angler usage of New Zealand lake and river fisheries NIWA 2016 cited in Olsen evidence-in-chief [43] [Environment Court document 16].

2.4 River birds

Overview of river bird ecology

[60] We rely on Dr Sanders' overview[47] of river bird ecology in his evidence-in-chief which was agreed to be accurate by Mr van Klink at an expert conference on 23 October 2018.

[61] It will be recalled that some stretches of the river are braided. Braided river birds are the assemblage of birds, especially native gulls, terns and wading birds, that depend to some extent on the terrestrial and aquatic habitats found on those sparsely-vegetated gravel river beds[48]. They also use a range of other habitats. Species such as black-fronted terns[49], South Island pied oystercatchers[50] and black-billed gull[51] nest and feed on habitats as diverse as riverside terraces, outwash moraines, pasture – especially irrigated pasture, farm ponds and wetlands. More generalist species such as waterfowl, shags and pied stilts[52] commonly use a wide range of habitats.

[62] The diet of these species varies greatly, with some feeding on aquatic foods such as fish, aquatic invertebrates and plants, and terrestrial foods including lizards, invertebrates and plants. Foraging habitat requirements also vary. For example, pied stilts and pied oystercatchers forage, at various depths depending on species, along the edges of flowing channels, pools or wetlands and also in wet substrates including wet pasture, whereas black-fronted terns feed mainly 'on the wing', on drifting or emerging insects and on small fish at or near the surface of streams and wetland or, in terrestrial habitats, on terrestrial invertebrates and sometimes lizards.

[63] Birds use these various habitats seasonally. The general pattern is for the various species of gull, tern and wading birds to begin arriving on rivers in late winter, nest on or near river beds during spring and early summer, then migrate back to their winter coastal habitats in late summer and early autumn.

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47 M D Sanders evidence-in-chief [17]-[22] [Environment Court document 27].
48 M D Sanders evidence-in-chief [18] [Environment Court document 27].
49 *Chlidonias albostriatus*.
50 *Haematopus finschi*.
51 *Larus bulleri*.
52 *Himantopus himantopus*.

Bird species

[64] Mr van Klink reported in his evidence-in-chief[53] on the results of surveys of birds on the Lindis River in the lower losing reach from October 2014-January 2015 and from October 2015 to January 2016. He observed eight species during his survey, three of which are threatened species. The ecologists agreed[54] these surveys provide a 'snapshot' of the birds' use of the river. Table 2.3 shows the species, whether endemic, native or introduced, their threat status and the numbers of each observed in 2014-15 and 2015-16.

Table 2.3 Bird species, threat status and numbers observed below SH8 October to January 2014-15 and 2015-16[55]

Bird species	Status	Threat status	10/14 10/15	11/14 11/15	12/14 12/15	1/15 1/16
Black-billed gull	endemic	Nationally critical	3 / 3	0 / 0	3 / 0	0 / 0
Black-fronted tern	endemic	Nationally endangered	35 / 25	2 / 33	4 / 20	0 / 0
SI pied oystercatcher	endemic	Declining	3 / 4	0 / 2	7 / 5	0 / 0
Pied stilt	native	Not threatened	72 / 24	7 / 23	20 / 28	0 / 0
White-faced heron	native	Not threatened	1 / 0	0 / 1	2 / 2	0 / 0
Mallard	introduced	Naturalised	12 / 10	0 / 6	2 / 0	0 / 0
Paradise shelduck	endemic	Not threatened	8 / 0	2 / 0	0 / 0	0 / 0
Grey teal	native	Not threatened	0 / 0	0 / 2	0 / 0	0 / 0
Black stilt	endemic	Nationally critical	1 observation by Mr van Klink 2016			

[65] Flows during the survey periods were obtained from the Ardgour FR and were around 4,000 l/s in October in both years, but by December had declined to around 500-1,000 l/s. By early January flows had ceased in both years.

[66] The most numerous species observed throughout the survey were pied stilts and back-fronted tern. Almost all the species recorded nest on the ground and most prefer open, flat expanses of bare or sparsely vegetated substrates which means that weed invasion is a major cause of habitat degradation in some rivers, including in the Lindis River. Nesting occurs mainly between September and December, with a few birds nesting as early as August or as late as January or February, again, varying

53 P van Klink evidence-in-chief [6] [Environment Court document 28].
54 Joint Witness Statement – River Birds [1(c)] [Exhibit 10.6].
55 P van Klink evidence-in-chief Table 2 and appendices 1 and 2 [Environment Court document 28].

among species.

[67] Predation has an "overwhelming[56]" influence on the abundance and long-term survival of river bird species, mainly because eggs and chicks are highly vulnerable to predation by both mammalian and avian predators. Predation rates of 75-100% at any given site are common. Cats, ferrets, hedgehogs and stoats are the main mammalian predators and harriers and southern black-backed gulls are the main avian predators, although the relative impacts of these varies between rivers. Adults sitting on nests are also vulnerable to mammalian predators and this is a major problem for the long-term viability of some species[57].

[68] Dr Sanders added[58] that floods, which are common in the breeding season, can have a major impact on breeding success by destroying nests and drowning chicks. Disturbance by humans and dogs can adversely affect nesting success and he considered this to be a likely problem for birds in Lindis River below SH8.

[69] Islands in rivers are considered to be relatively safe from mammalian predators. Dr Sanders considered that studies over recent years have demonstrated that this is a real effect but that the effect is generally weak and highly variable. This is almost certainly because all mammalian predators can swim (some very readily cross large channels) and because avian predators (especially black-backed gulls[59] and harriers) are unaffected by flow and can have a major impact on river birds[60]. Dr Sanders and Mr van Klink agreed that the irrigation regimes being considered could change the number and size of braids, thereby changing the probability of mammalian predators reaching islands and preying on eggs, chicks and adult bird, and alter the food supply of the river birds, by affecting the species composition and abundance of aquatic invertebrates and fish which form part of the diet of many river birds.

[70] In summary, the most important reach of the river for braided river birds was agreed to be the short Crossing reach downstream of SH8 because it has the most open gravel river bed habitat, albeit degraded by weeds and 4WD vehicles, and it is where most birds have been observed.

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56 M D Sanders evidence-in-chief [22] [Environment Court document 27].
57 M D Sanders evidence-in-chief [22] [Environment Court document 27].
58 M D Sanders evidence-in-chief [23] [Environment Court document 27].
59 *Larus dominicanus*.
60 Joint Witness Statement – River Birds [12] [Exhibit 10.6].

2.5 The water races

[71] The four race extractions that take most of the water from the Lindis River are authorised by mining privileges or subsequent water permit. Ordering these from the highest take point upstream, they are[61]:

- Tarras Race (up to 1,247 l/s permitted);
- Ardgour Race (up to 708 l/s permitted);
- The Point (Rutherford's) Race (up to 333.33 l/s permitted); and
- Begg-Stacpoole Race (up to 100 l/s permitted).

It should be noted that actual take rates are almost always less than those figures.

[72] When the Crown divested itself of irrigation schemes, those assets, including the associated mining privileges, were transferred to the Lindis Irrigation Company Limited, which is a member of LCG.

[73] The main water races take relatively large proportions of water from the river quite high[62] in the catchment[63]. That means the river is substantially dewatered from a long way (23 kms) upstream, with consequent effects on the river's ecosystem. A key point of LCG's appeal (and of its application for water permits) is to keep water in the river for longer and only take water close to the areas of use.

2.6 Farming and irrigation in the Lindis catchment

[74] The Lindis catchment has been farmed since the 1880s[64]. Most of the farming was classic dryland pastoral farming. Irrigation on a larger scale increased after the construction of the Tarras Race in the 1920s, although as its name suggests that race took water out of the Lindis catchment through a low saddle north-east of Tarras.

[75] Currently some 88,000 ha in the catchment are in pastoral production. Of the 25 farms currently in operation 18 are high country stations and seven relatively

61 ORC opening submissions [36] [Environment Court document 1].

62 This is possible because of a particular hydrological characteristic of the river – that (as noted above) 80% of the MALF comes from the catchment above the Lindis Peak FR.

63 See Table 2.1 above.

64 C N Taylor evidence-in-chief [46] [Environment Court document 36].

intensive farms at lower elevation[65]. Several of the large high-country stations, which run sheep, cattle and some deer on the hill country, irrigate on the lower parts of their properties for pasture or to produce feed crop, reducing grazing pressure on the high country over summer. Irrigation of the more intensive properties lower down the catchment area allows breeding and finishing of cattle, along with production of fodder crops. Viticulture, summer fruit and lifestyle blocks provide a diversity of land uses that rely on irrigation[66]. Currently approximately 1,355 ha are spray-irrigated, with a further 901 ha irrigated by border dyke and flood irrigation[67]. The proposed change to PC5A by LCG is expected to increase the area of spray irrigation with some less efficient border dyke and flooding irrigation being phased out. How far we can ensure that is one of the practical questions raised in these proceedings.

Development and status of the irrigation system

[76] The opening submissions for the ORC usefully set out the details of the status of water takes and the mining privileges ("deemed water rights") under which many of the takes for irrigation operate. These are to be relinquished on 1 October 2021. There are currently 34 permits to take surface and connected groundwater, 19 of these being mining privileges. The total (primary) allocation of the Lindis River is 3,776.98 l/s, of which mining privileges share 3,330 l/s. The Tarras and Ardgour Races were constructed in the 1920s by the then Public Works Department and eventually transferred to the Lindis Irrigation Company Ltd in 1989[68]. In *Minister of Conservation v Otago Regional Council*[69] the Environment Court said, "The exercise of these privileges and the infrastructure which facilitates their use is an established and integral part of the environment in the catchment[s] subject to these mining privileges". However, as will be seen, that is (probably) only while the privileges last.

[77] Under the transitional provisions of the RMA, mining privileges (including "rights in substitution" granted under the Water and Soil Conservation Act 1967) retain[70] their status and effect until 1 October 2021. Arguably (the position is unclear) these deemed permits are not subject to any minimum flow in the regional plan, or to any other

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65 K T Sanderson evidence-in-chief [21]-[22] [Environment Court document 25].
66 C N Taylor evidence-in-chief [45] [Environment Court document 36].
67 ORC opening submissions [27] [Environment Court document 1].
68 G N Martin evidence-in-chief [19]-[23] [Environment Court document 5].
69 *Minister of Conservation v Otago Regional Council* C28/2002 at [15].
70 Sections 413 and 417 of the Act.

statutory conditions[71].

3 The Otago Regional Plan: Water and Plan Change 5A

3.1 The scheme of the Regional Plan: Water for Otago

[78] The Regional Plan: Water for Otago ("the ORP:W") became operative on 1 January 2004. It has been subject to a number of plan changes since then. All operative changes to 1 March 2016 are included in the version cited below. While the ORP:W is to be read as a whole[72], the principal relevant objectives and policies are found in Chapter 5 (Natural and Human Use Values of Lakes and Rivers) and Chapter 6: Water Quantity. There is a lucid exposition of these chapters in Dr Cowie's evidence[73].

Chapter 5: Values of lakes and rivers

[79] In Chapter 5, Objective 5.3.1 is to maintain or enhance the values identified in certain Schedules[74] of Otago's lakes and rivers. Two sets of values are recognised in Schedule 1A of the ORP:W: human values and ecosystem values. In relation to the former the Lindis River is recognised as having "a high degree of naturalness above 900 metres [above sea level]". Under the heading "Ecosystem Values" the schedule records somewhat cryptically:

> Pgravel, Weedfree, Hspawn(t), Hjuve(t), Eel, Trout.

The code[75] for those values explains that:

- *Pgravel* means there is a substratum of gravel which is a bed composition of importance for resident biota;
- *Weedfree* refers to absence of aquatic pest plants (e.g. *Lagarosiphon*);
- *Hspawn(t)* refers to the presence of significant fish spawning areas (for trout);

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71 ORC opening submissions [47] [Environment Court document 1].
72 Chapter 1.5 (Integrated management): ORP:W, p 1-8.
73 B Cowie Section 87F Report [Environment Court document 46]
74 Schedules 1A, 1B and 1C of the ORP:W.
75 Table 3 of the Schedules to the ORP:W.

- *Hjuve(t)* refers to the presence of significant areas for development of juvenile fish (trout);
- *Eel* refers to significant presence of eels;
- *Trout* refers to significant presence of trout.

The schedules expressly recognise that its list of values may not be comprehensive.

[80] Objective 5.3.2 is to maintain or enhance the values of significance[76] to Kāi Tahu. Other objectives are to protect the natural character of (relevantly) rivers and their margins from inappropriate development[77], to maintain or enhance amenity values[78] of, and access to and along[79], rivers, and to maintain and enhance heritage values[80]. Finally but importantly as a counterweight to those, Objective 5.3.6 is to provide for the sustainable use and development of Otago's water bodies and the beds and margins of rivers.

[81] The relevant policies identifying and protecting natural and human use values of lakes and rivers are 5.4.1 and 5.4.2. The first is:

> 5.4.1 To identify the following natural and human use values supported by Otago's lakes and rivers, as expressed in Schedule 1:
>
> (a) Outstanding natural features and landscapes;
>
> (b) Areas with a high degree of naturalness;
>
> (c) Areas of significant indigenous vegetation, significant habitats of indigenous fauna, and significant habitats of trout and salmon;
>
> (d) Ecosystem values;
>
> (e) Water supply values;
>
> (f) Registered historic places; and
>
> (g) Spiritual and cultural beliefs, values and uses of significance to Kāi Tahu.

The explanation adds that Schedule 1A covers values (a) to (d).

[82] Policy 5.4.2 is:

> 5.4.2 In the management of any activity involving surface water, groundwater or the bed

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76 Identified in Schedule 1D of the ORP:W.
77 Objective 5.3.3 ORP:W.
78 Objective 5.3.4 ORP:W.
79 Objective 5.3.5 ORP:W.
80 Objective 5.3.7 ORP:W.

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 Kāi 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.

[83] On natural character, the Environment Court when evaluating the effect of a proposed hydroelectric scheme on the Wairau River in Marlborough in *Director-General of Conservation*[81] "... accept[ed] that any human induced changes to the natural elements, patterns and processes are an effect on natural character". We agree. There is also a specific policy about this in Policy 5.4.8 ORP:W which we consider later when identifying the options before us.

Chapter 6: Water quantity

[84] The most relevant chapter of the ORP:W is Chapter 6 dealing with water quantity. It is interesting that the situation before the court is expressly recognised by the ORP: W in the introduction to Chapter 6: Water Quantity: "The transition to resource consents [from mining privileges] ... will recognise current access to water, but will also consider the purpose of use for the water, and protection of aquatic ecosystems and natural character of the affected waterbodies"[82]. Mr Logan submitted it is misconceived to take as the starting point an environment in which no abstraction (except for drinking and stock water) will occur. The explanations and principal reasons emphasise the need to continue access to water for existing and new uses[83].

[85] Objectives seek both to retain flows in rivers "sufficient both to maintain their

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81 *Director-General of Conservation (Nelson-Marlborough Conservancy) v Marlborough District Council* [2010] NZEnvC 403 at [591].

82 Section 6.1, p 6-2 ORP:W.

83 Objective 5.3.6, 6.1 Introduction, Explanations and Principal Reasons for Objective 6.3.2 and Policies 6.4.2, 6.4.2A and 6.4.2AA ORP:W.

life-supporting capacity for aquatic ecosystems, and their natural character"[84] and to "provide for the water needs of Otago's primary and secondary industries..."[85].

[86] Other relevant objectives are to minimise conflict among those taking water[86], maximise[87] the opportunity for diverse consumption of water which is available for taking, minimise adverse effects on the quality of receiving water[88], and minimise any adverse downstream effect of managed flows[89]. We note it is the opportunity for diverse consumption which is to be maximised, not a direction as to how that is to be achieved. This is of some importance given submissions we received on this issue. There is also an objective[90] to maintain long term groundwater levels and water storage in the region's aquifers.

[87] The first few implementing policies provide for integrated and technically efficient management of the region's water. The relevant policies are:

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

[88] Against that background, the key policy for the taking of (surface) water is:

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84 Objective 6.3.1 ORP:W (the word 'maintain' in this objective caused some controversy which we discuss later).

85 Objective 6.3.2 ORP:W.

86 Objective 6.3.3 ORP:W.

87 Objective 6.3.4 ORP:W.

88 Objective 6.3.5 ORP:W.

89 Objective 6.3.6 ORP:W.

90 Objective 6.3.2A ORP:W.

6.4.1 To enable the taking of surface water, by:

(a) Defined allocation quantities; and

(b) Provision for water body levels and flows,

except when:

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

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

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

This is the first of two specific structural policies for this proceeding, which is about defining the allocation quantities and flows for the Lindis River.

[89] We note that surface water takes include connected groundwater takes:

6.4.1A A groundwater take is allocated as:

(a) Surface water, subject to a minimum flow, if the take is from any aquifer in Schedule 2C; or

(b) Surface water, subject to a minimum flow, if the take is within 100 metres of any connected perennial surface water body; or

(c) Groundwater and part surface water if the take is 100 metres or more from any connected perennial surface water body, and depletes that water body most affected by at least 5 litres per second as determined by Schedule 5A; or

(d) Groundwater if (a), (b) and (c) do not apply.

Given the connection of the Lindis River to the ribbon aquifer, the relevance of this policy is obvious.

[90] The explanation for Policy 6.4.1 expands on the policy by identifying three types of allocation of surface water[91] and linking them to minimum (and other) flows in this way:

- *Primary allocation* of surface water takes [which] are subject to the lowest minimum flows;
- *Supplementary allocation* surface water takes [which] are subject to higher minimum flows; and
- *Further supplementary allocation* [which] may be taken at flows greater than natural

91 ORP:W pp 6-14.

mean flow.

[Bullet points and italics added]

What is a primary allocation?

[91] As between those three types of allocation, these proceedings are mainly concerned with the *primary allocation* from the Lindis River. That term is defined in Policy 6.4.2, which is:

> To define the primary allocation limit for each catchment, from which surface water takes and connected groundwater takes may be granted, as the **greater** of:
>
> (a) That specified in Schedule 2A, but where no limit is specified in Schedule 2A, 50% of the 7-day mean annual low flow; or
>
> (b) The sum of consented maximum instantaneous, or consented 7-day, takes of:
>
> (i) Surface water as at:
>
> ...
>
> (3) 28 February 1998 in any other catchment; and
>
> (ii) Connected groundwater as at 10 April 2010,
>
> less any quantity in a consent where:
>
> (1) In a catchment in Schedule 2A, the consent has a minimum flow that was set higher than that required by Schedule 2A.
>
> (2) All of the water taken is immediately returned to the source water body.
>
> (3) All of the water being taken had been delivered to the source water body for the purpose of that subsequent take.
>
> (4) The consent has been surrendered or has expired (except for the quantity granted to the existing consent holder in a new consent).
>
> (5) The consent has been cancelled (except where quantity has been transferred to a new consent under Section 136(5).
>
> (6) The consent has lapsed.
>
> [Emphasis added]

[92] The Lindis River is not identified in Schedule 2A, so the ORP:W does not identify either a minimum flow or a primary allocation limit for this river. PC5A proposes to supply answers to those omissions.

[93] The principal reasons for Policy 6.4.2 explain that:

> This policy is adopted, in conjunction with the application of minimum flows, for catchments identified in Schedule 2A, to provide certainty regarding the availability of water resources for taking, while ensuring the effects of takes on the life-supporting capacity for aquatic ecosystems and natural character of rivers are no more than minor. This policy also

> provides a conservative primary allocation for unscheduled catchments until studies can determine the appropriate allocation limits. However, these catchments are not identified in Schedule 2A, and they do not have minimum flows specified in the Plan.
>
> This policy, along with Policies 6.4.2A and 6.4.2AA, are intended to reduce unutilised consented primary allocation over time, which will enable lowering of supplementary minimum flows.

[94] Policy 6.4.2 is confusingly drafted but we understand it to mean that the primary allocation limit is the **greater** of:

(1) the limit contained in Schedule 2A of the ORP:W[92]; or

(2) where no limit is given in Schedule 2A, 50% of the 7-Day Mean Annual Low Flow[93]; or

(3) subject to (4), the sum of consented maximum instantaneous, or consented 7-day takes of[94]:

(i) surface water as at:

...

28 February 1998 in any [other] catchment; and

(ii) connected groundwater as at 10 April 2010

provided that:

(4) the summed figure under (3) must have deducted[95] from it the volume in any consent which (relevantly) has been surrendered or has expired[96] or been cancelled[97].

Mr Logan described this as a "sinking lid" policy, but if so it is of a peculiar kind in that it acts retrospectively. Any person can apply for up to the highest primary allocation figure right up until the expiry date of the water permits that determine the limit (or lid).

[95] The Schedule 2A figure for primary allocation in the notified PC5A was 1,000 l/s, but no party seeks to retain that. By applying Policy 6.4.2 the following candidate figures for a primary allocation limit can be generated:

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92 Policy 6.4.2(a).

93 Policy 6.4.2(a) – second part.

94 Policy 6.4.2(b).

95 Policy 6.4.2(b) – second part.

96 Policy 6.4.2(b) – second part, (4).

97 Policy 6.4.2(b) – second part, (5).

- 1,200 l/s being the figure in Schedule 2A under the Commissioners' Decision is 1,200 l/s[98];
- 875 l/s being 50% of the 7-day MALF. This is the specific primary allocation limit as it would apply to the Lindis catchment in Schedule 2A;
- 3,777 l/s being the sum of the maximum consented takes after discounting those lapsed or surrendered.

As stated the primary allocation limit is the greater of those three figures. Thus, at the date of this decision the limit is 3,777 l/s. So for approximately 15 years the Lindis River has been "managed" under a very unsatisfactory scheme which, at first sight, over-allocates water quite drastically on the measuring-stick used by the ORP:W.

[96] The somewhat theoretical nature of any primary allocation limit, at least in the short term, was explained by Dr Cowie[99]:

> Policy 6.4.2A applies where the primary allocation is based on the sum of consented maximum instantaneous takes. This is the case for the Lindis catchment. Under Policy 6.4.2A the ORC will generally not replace allocation without a 'history of use' to be shown primarily through monitoring records in the Lindis Catchment. Using water take records from 2013 – 2017, the ORC has assessed that of the sum of maximum recorded rates of takes all consented primary allocation takes equals 3,248 l/s. Therefore, if the current policy framework of the Water Plan were to be applied when replacing the existing consents in the Lindis catchment the primary allocation can be expected to be as high as 3,248 l/s. For this reason, the Schedule 2A limit of 1,200 l/s can be regarded as an 'aspirational' future target.
> (Underlining added)

No party disagreed with that position.

[97] As recorded, the ORC and the LCG agreed on a primary allocation for the Lindis River of 1,650 l/s (now reduced to 1,639 l/s). This limit provides for:

- all the consents being sought by the LCG as part of the current proposal, along with
- four existing consents granted under the RMA which are not expiring in 2021 and not being replaced, and on

98 But no party seeks to reform that.

99 B Cowie Section 87F Report at [329] [Environment Court document 46].

- applications in train[100].

[98] The retrospective nature of Policy 6.4.2 raises a timing issue. While we accept that LCG is being responsible in its application, if we are to grant consents in the water permit proceeding, the commencement date may need to be deferred until the day after expiry in October 2021. Since the LCG is "only" seeking a primary allocation of 1,639 l/s, in theory the difference could be applied for by some third party between now and that date albeit as a discretionary activity.

[99] The annual volumes of water recommended to be granted are consistent with the Aqualinc work[101] on water demand in the Lindis catchment during the irrigation season.

[100] Policy 6.4.2A then states (relevantly):

> 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...

[101] Policy 6.4.2AA adds another recipe for achieving efficiency:

> Where Policy 6.4.2A applies and, under the existing consent, water was usually taken at flows above the minimum flow calculated for the first supplementary allocation block for that catchment, to consider granting the new resource consent to take water as supplementary allocation.

The setting of minimum flows in Chapter 6 ORP:W

[102] We now turn to the policy which is at the heart of these proceedings. To restrict *primary allocations, minimum flows* are set by Policy 6.4.3:

> 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.

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100 See Table 3 of the AEE.

101 *Guidelines for reasonable irrigation water requirements in the Otago Region*, prepared by Aqualinc for the ORC dated 24 July 2017; referred to in Section 87F Report [Environment Court document 46].

In fact, the Lindis Catchment is not (in the unamended ORP:W) referred to in Schedule 2A of that plan, so the next policy applies for the setting of a minimum flow:

> 6.4.4 For existing takes outside Schedule 2A catchments, minimum flows, for the purpose of restricting *primary allocation* takes of water, will be determined after investigations have established the appropriate minimum flows in accordance with Method 15.9.1.3.[102] The new minimum flows will be added to Schedule 2A by a plan change and subsequently will be applied to existing takes in accordance with Policy 6.4.5(d).
>
> For new takes in a catchment outside Schedule 2A, until the minimum flow has been set by a plan change, the minimum flow conditions of any primary allocation consents will provide for the maintenance of aquatic ecosystems and the natural characteristics of the source water body.

PC5A is a plan change for the Lindis catchment as contemplated by this policy.

Application of the minimum flow regime

[103] The application of the minimum flow regime to existing and future water permits (for taking of water) is set out in Policy 6.4.5. This states (relevantly):

> The minimum flows established by Policies 6.4.3, 6.4.4, 6.4.6, 6.4.9 and 6.4.10 will apply to resource consents for the taking of water, as follows:
>
> (a) In the case of new takes applied for after 28 February 1998, upon granting of the consent; and
>
> ...
>
> (c) In the case of any existing resource consent to take water from the [Lindis catchment area,] Luggate catchment area, Manuherikia catchment area... as defined in Schedule 2A, upon collective review of consent conditions within those catchments under Sections 128 to 132 of the Resource Management Act; and
>
> (d) In the case of any existing resource consent to take water within a catchment area not specified in Schedule 2A, upon the establishment of a minimum flow set for the water body by a plan change, subject to the review of consent conditions under Sections 128 to 132 of the Resource Management Act.

[104] The words in square brackets – "[the Lindis catchment area]" – are added by

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102 Method 15.9.1.3(c) simply states that the ORC would "commence investigations into the effect of deemed permits (mining privileges) ... for the taking of surface water ... [by 2009]".

PC5A. The point of the agreed change to Policy 6.4.5 (the addition of a reference to the Lindis catchment) appears to be to allow review of the conditions of those water permits to achieve the minimum flows to be set by the consent. The explanation includes a statement[103] relevant to this proceeding:

> In the case of mining privileges in respect of water (deemed permits, see Appendix 2) the [RMA] provides for their continuation without restriction, unless compensation is made, until they expire in 2021.

[105] Of relevance to the water permit proceeding, Policy 6.4.6 then allows discretionary applications for takes from a Schedule 2A river:

> 6.4.6 To consider granting an application for a resource consent to take water from a Schedule 2A river, within primary allocation, subject to a minimum flow lower than that specified in Schedule 2A, on a case-by-case basis, provided:
>
> (a) The take has no measurable effect on the flow at any Schedule 2A monitoring site at flows at or below the minimum flow applying to the primary allocation; and
> (b) Any adverse effect on any aquatic ecosystem value or natural character of the source water body is no more than minor; and
> (c) There is no adverse effect on any lawful existing take of water.

Residual flows and supplementary allocations

[106] Residual flows are the subject of 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.

[107] Supplementary allocations are provided for at higher flows:

> 6.4.9 To provide for supplementary allocation for the taking of water, in blocks of allocation where that is appropriate:
>
> (a) Such that up to 50% of flow at the catchment main stem, minus the assessed actual take, is available for allocation subject to a minimum flow set to ensure that no less than 50% of the natural flow remains instream; or

103 ORP:W p 6-22.

(b) On an alternative basis, provided:

(i) The take has no measurable effect on the flow at any Schedule 2 monitoring site, r any site established in terms of Policy 6.4.4, at flows at or below any minimum flow applying to primary allocation; and

(ii) Any adverse effect on any aquatic ecosystem value or natural character of the source water body is no more than minor; and

(iii) There is no adverse effect on any lawful existing take of water

(c) Supplementary allocations and associated minimum flows for some catchments are set in Schedule 2B.

This has been described as providing for "50-50 flow sharing" between in-stream and out-of-stream (i.e. extractive use). We consider that is a slightly misleading description: it is a method of reducing the privilege which is a water permit in order to meet the bottom lines of the ORP:W.

Other policies managing water takes

[108] There is another important set of policies (6.4.11 to 6.4.19) in Chapter 6 which apply to all water takes. These enable the Council (inter alia) to suspend[104] the taking of water at the minimum flows set under the ORP:W; to promote and support water allocation committees[105] (or water management groups)[106]; to assist in water rationing among water takes, either support establishment of a water management group[107] or establish a water allocation committee[108]; and to include in permits to take water a condition that consent holders comply with "... any council approved rationing scheme"[109]. These policies allow the Council to build some flexibility into its management of the water resource by allowing for yearly or monthly or daily variations in water flows and demands (and transfers of takes) at different points down the catchment. In particular these policies mean that the primary allocation (limit) may be a theoretical maximum.

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104 Policy 6.4.11 ORP:W.
105 Policy 6.4.12 ORP:W.
106 Policy 6.4.12A ORP:W.
107 Policy 6.4.12B(a) ORP:W.
108 Policy 6.4.12B(b) ORP:W.
109 Policy 6.4.12C ORP:W.

Schedule 2D

[109] We should also record that there is a Schedule 2D to the ORP:W which states:

> **2D Schedule of matters to be considered when setting minimum flows and allocation limits**
>
> Primary allocation limits and minimum flows will be added to Schedule 2A, to give effect to the objectives and policies in this Plan, through the plan change process following scientific investigation and consultation with the community and affected parties. The lists in 2D.1 and 2D.2 identify matters to which consideration will be given when setting these flows and limits. The lists are not exhaustive, and consideration will be given to these and any other relevant matters.
>
> 2D.1 When setting minimum flows in Schedule 2A for a catchment, consideration will be given to the following matters:
>
> (a) Any existing or previous minimum flow regime or residual flow;
> (b) The 7-day mean annual low flow;
> (c) Interaction among water bodies;
> (d) Ecological values, including the need for flow variability;
> (e) Demand for water, including community water supplies;
> (f) Existing water uses and associated infrastructure;
> (g) Environmental, social, cultural, recreational and economic costs and benefits of taking and using water before and after the implementation of a minimum flow regime; and
> (h) Any other relevant matter in giving effect to Part 2 of the Resource Management Act.
>
> 2D.2 When setting primary allocation limits in Schedule 2A for a catchment, consideration will be given to the following matters:
>
> (a) Amount of water currently allocated as primary allocation;
> (b) Amount of water currently taken as primary allocation;
> (c) Any other existing taking and using of water;
> (d) The 7-day mean annual low flow;
> (e) Proposed minimum flow regime;
> (f) Possible sources of water;
> (g) Acceptable duration and frequency of rationing among consented water users; and
> (h) Social and economic benefits of taking and using water.
>
> Note: For catchments not included in Schedule 2A, refer to Policy 6.4.4 for determining minimum flows and Policy 6.4.2 for identification of primary allocation.

Remarkably this Schedule is not referred to in Chapters 5 or 6 of the plan. However, it is clearly relevant, if not comprehensive, in relation to both the setting of minimum flows and allocation limits. The Schedule is important because it reinforces the obligation to

look at both the recent past (the Status Quo) and the remoter past in addition to the future. This suggests there is no emphasis on the Naturalised Flow over the Status Quo option: both are relevant.

Summarising the scheme of the ORP:W

[110] An important part of the scheme of the ORP:W (into which PC5A is designed to fit) is, that any application for water takes is a fully discretionary activity. We consider that the legal effects of that have not been fully thought through by the parties especially in relation to the different scenarios they put forward in evidence.

[111] To see the importance of the status of water takes under the ORP:W it is worth considering what would be a relevant scenario if the taking of water was a permitted (or controlled) activity under the plan. In that case, we would have hoped to receive evidence, largely as we did in this case, which deals with the worst-case scenarios under the competing options. For example Fish and Game would be expected to put forward a maximum possible takes scenario just as it did here to see what the effects of 1,640 l/s (or 3,777 l/s) all being taken simultaneously would be.

[112] But, since any proposed take is discretionary, we do not have to give much weight to worst-case scenarios when considering the plan change. We should assume that the ORC will do as it ought on a discretionary application and decline to grant water permits for takes that do not implement the relevant objectives and policies in the ORP:W. So what we should be considering in this decision is the best[110] (not the worst) practicable scenario for each of the competing options. The principle is well established: in an old English case about bylaws (the equivalent of rules in a regional plan) governing *Williams v Weston-super-Mare Urban District Council*[111] Channell J asked (and answered) this question:

> Then is the by-law made bad by reservation of what is in form an arbitrary power to license or sanction particular stalls, or particular individuals to have stalls? I do not think it is. I think the principle, amongst others, established by *Kruse v Johnson* [1898] 2 Q.B. 91 is that you are not to spell out things in by-laws to find a possible case – and there has been a decision since in which this has been said – which would come within the general words,

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110 That is, most appropriate under section 32 RMA.

111 *Williams v Weston-super-Mare Urban District Council* (1907) 98 L.T. 537 (which was expressly approved by the Court of Appeal in a subsequent case between the same parties: (1910) 103 L.T. 9.

> and to suggest a case which would be perfect nonsense, and then, because you could do that with regard to something which no one would think of prohibiting, to say that the whole by-law is bad. That is not the way to look at a by-law. The reservation of this power in the by-law is just the sort of thig which makes the prohibition of all stalls upon the foreshore reasonable and proper, because it is, in substance, provided that if any particular case there are good grounds shown to the local authority for making an exception, they may make it. That is just the thing that prevents an otherwise too general prohibition from being unreasonable.
> (ibid., 540)

[113] That decision was cited as authority by North J in the Court of Appeal's decision of *Ideal Laundry Limited v Petone Borough*[112] and that in turn was endorsed as relevant to the RMA by Cooke P in *Auckland Regional Council v North Shore City Council*[113]. The principle is important because it renders largely irrelevant to this decision (but not necessarily to the WPs decision) a good deal of the submissions and cross-examination we read and heard on a "Maximum" scenario.

3.2 PC5A (Lindis: Integrated Water Management)

[114] As recorded, PC5A which is called "Lindis: Integrated Water Management" is a plan change of the kind expressly contemplated by Policy 6.4.4 of the ORP:W at least in respect of the setting of a minimum flow and a primary allocation limit.

[115] The amendments proposed by PC5A are to:

(1) set, in Schedule 2A of the ORP:W, a primary allocation limit and associated minimum flow for the Lindis River;
(2) set, in Schedule 2B of the ORP:W, the supplementary allocation and associated minimum flows;
(3) amend Schedule 2C to provide for the Lindis Alluvial Ribbon Aquifer to be treated as part of the surface water primary allocation in the Lindis catchment;
(4) amend Schedules 4A and 4B to set maximum allocation limits for the Ardgour Valley, Bendigo and Lower Tarras aquifers and take restrictions for the Bendigo and Lower Tarras aquifers;
(5) include the Lindis catchment area in the restricted discretionary activity

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112 *Ideal Laundry Limited v Petone Borough* [1957] NZLR 1038 (CA) at 1054.
113 *Auckland Regional Council* v *North Shore City Council* [1995] NZRMA 424 (CA) at [431]-[432].

rules for water takes; and

(6) make consequential changes to maps.

Only the primary allocation limit and associated minimum flow – that is (1) and (2) – are now in issue in this proceeding. As noted, PC5A also contemplated a change to Chapter 6 itself: the addition of a reference to the Lindis catchment area to Policy 6.4.5 (which describes the application of minimum flows) and this is not opposed.

[116] PC5A makes only one change to the rules of the ORP:W: taking of water for the Lindis catchment as part of the *primary allocation* will be a restricted discretionary activity under rule 12.1.4.4. This is achieved by PC5A adding the "Lindis catchment" to the list in that rule.

[117] As we noted earlier, the ORP:W is out-of-date in the sense that there are two later higher order statutory instruments which we must give effect to: the new ORPS and the NPSFM. The ORP:W is out-of-date and incomplete anyway because a method for implementing Policy 6.4.4 has not been complied with. Method 15.9.1.3 states that the ORC will "(b) Identify water bodies with significant native fish values within five years of this Plan becom[ing] operative ..."[114].

[118] For all these reasons the weight to be given to the ORP:W is a difficult issue we will return to in our evaluation (Chapter 8).

3.3 The options for Plan Change 5A before the court

[119] In terms of the two variables for insertion into the ORP:W and which are the principal subject of dispute, the potential *options*[115] put to the court are shown in Table 3.1:

114 The ORP:W became operative on 1 January 2004.

115 See the discussion of section 32 RMA in Chapter 4 of this decision.

Table 3.1 Options for primary allocation and minimum flow before the court

Name of option	Source of jurisdiction	Minimum Flow at Ardgour FR (l/s)	Primary Allocation Limit (l/s)
Status quo	ORP:W	NA	3777
PC5A (notified)	PC5A (notified)	750 (1 Oct-31 May) 1600 (1 Jun-30 Sep)	1000
900 MF	Commissioners' Decision	900	1200
550 MF	LCG appeal	550[116]	1640
NF (for "naturalised flow")	Nil	N/A	Nil

[120] The Naturalised Flow option is still relevant but not for the reasons Ms Baker-Galloway gave. She constructed an argument based on a resource consent case *Ngāti Rangi Trust v Manawatu-Whanganui Regional Council*[117] ("*Ngāti Rangi*") for why the court should look at the "existing environment" – by which she meant, in effect, the natural flow on this plan change. We do not consider it is necessary to resolve that issue because, as we have seen, the ORP:W requires[118] us to consider the natural flow and other characteristics of the river – that is the *Naturalised Flow* option – anyway. Of course the regional plan also requires us to examine the Status Quo option too.

[121] We discuss these options further in the context of the section 32 requirements in Chapter 4.8.

3.4 The section 293 RMA application

[122] The LCG's appeal seeks that a minimum flow of 550 l/s be set at the Ardgour FR. It is useful to consider what that means for low(er) flows in the river. If the flow at Lindis Peak FR is, say, 2,190 l/s (being 1,640 + 550 l/s) water could be abstracted from anywhere upstream (up to a total of 1,640 l/s) – for example via the existing races – so long as the flow is 550 l/s (at the Ardgour FR) about 27 km downstream of the Tarras Race intake. Obviously if the water is taken from higher upstream, as under the status quo, the lower river is substantially dewatered. But if the take points are further down river then there is more water in the river for longer segments.

[123] As we have recorded, one of the principal points of the LCG's application for

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116 The LCG notice of appeal sought a minimum flow of 450 l/s but at the hearing it increased the minimum flow sought to 550 l/s; similarly the appeal originally sought primary allocation limit of 1,900 but that was subsequently reduced.

117 *Ngāti Rangi Trust v Manawatu-Whanganui Regional Council* [2016] NZHC 2948.

118 Policy 5.4.8 ORP:W.

resource consent is to ensure that all water takes are from as close as possible to where the water will be used, thus ensuring water stays in the river for longer. That can be ensured by conditions on individual resource consents, but it was not the subject of any proposal provided in PC5A. The effect of that omission is that there is a danger that someone might apply for a further (or alternative) resource consent seeking to take water through one of the existing races as we have mentioned. The probability is particularly high given the curious voluntary sinking lid method of defining the primary allocation. In effect the limit set does not sink until after water permits have been obtained. PC5A does nothing to remedy this weakness of the primary allocation definition and policy in the ORP:W.

[124] The other problem – the (agreed) relative inefficiency of using races – is easier to deal with: the court suggested at the November 2018 hearing that the ORC should look at applying under section 293 RMA. The Council acted on that and its application[119] seeks to add to PC5A a policy and a rule about closing off the races. The proposed policy is:

> To enhance the life-supporting capacity and natural character of the mainstem of the Lindis River by prohibiting any take and use of water from the Lindis River by the Tarras Race (NZTM 2000 E1323951, N5030895), the Ardgour Race (NZTM 2000 E1324150, N5032696), the Point Race (NZTM 2000 E1322752, N5028693) and the Begg-Stacpoole Race (NZTM 2000 E1315078 N5023649).

[125] The proposed rule is:

> Rule 12.0.1.5: The taking and use of water from the Lindis River by the Tarras Race (NZTM 2000 E1323951, N5030895), the Ardgour Race (NZTM 2000 E1324150, N5032696), the Point Race (NZTM 2000 E1315079 N5023649) are prohibited activities, except as expressly allowed by resource consents RM17.301.07 AND RM17.301.09A and deemed permits WR1753CR.V2 and WR7787/96CR.V2.

[126] Members of the Lindis Catchment Group supported[120] the proposal, as did Federated Farmers of NZ Inc, although in most cases the support was contingent on the minimum flow being set at 550 l/s and the primary allocation at 1,639 l/s.

119 ORC Statement dated 14 December 2018 at [13] and [14] [Environment Court document 49].
120 ORC Statement dated 14 December 2018 Appendix C [Environment Court document 49].

[127] As for the consent holders for the races, their positions are[121]:

- Lindis Irrigation Limited, the irrigation company that currently holds the rights to take water from the Lindis River through the Tarras and Ardgour Races (and 18 of the 33 persons who presently take water from these races) supports the proposal;
- the Rutherfords, who have their own race, support the proposal;
- Mr Perriam, one of the two parties who hold rights to take water from the Begg-Stacpoole Race, expressed support for closing this race and Bendigo Terrace Farming Partnership, the other party, made no submission.

[128] The Department of Conservation supported the proposal but noted that it would not preclude the possibility of other races being constructed in future.

[129] The parties opposed had a number of concerns[122]. These included that the proposal and the closure of the races will not meet the minimum flow or primary allocation limit in PC5A (e.g. Fish and Game). The Upper Clutha Angling Club and Ms S E Keith considered that the policy and rule should not be specific to certain races or a particular allocation regime and sought that all races be decommissioned after the deemed permits expire regardless of whether or not the LCG's galleries proposal (in relation to the Water Permit decision) is consented. That is an extension of the section 293 application and therefore beyond our jurisdiction.

[130] The Hanan family wanted the Begg-Stacpoole Race to remain open to provide for their domestic supply but rather inconsistently they also sought a higher minimum flow of 900-1,200 l/s.

[131] The section 293 application attempts to ensure that the benefits of the galleries scheme would be achieved by ensuring the four main races are closed after the proposed 5-year transition period and could not be re-opened. This would mean that the river will have to be used, instead of races, as a conduit for irrigation water, so more will be retained in the Lindis River for a longer distance. In addition the location of the takes would have to be moved downstream. If the races were no longer available, the incentive to go with the MF 550 option by exercising the permits (if any) granted under

121 B Cowie supplementary evidence-in-chief Appendix 3 at [3] [Environment Court document 46B].
122 B Cowie supplementary evidence-in-chief Appendix 3 at [5] [Environment Court document 46B].

the WPs decision would be increased.

4 Matters to be considered and other legal issues

4.1 Should the appeal on PC5A be resolved first?

[132] We have described how the appeal on PC5A and the section 87G application for resource consents were heard together. It is axiomatic that they should be considered separately since different considerations apply in each proceeding – see the Supreme Court's decision about a similar situation in *Sustain our Sounds Inc v New Zealand King Salmon Company Limited*[123] ("*SOS*"). Two further questions then arise: "which proceeding should be determined first – the appeal or PC5A (this proceeding) or the water permits application", and "should the water permits applications be considered in the plan change appeal"?

[133] On principle we should decide PC5A first, mainly because it was first in time, but also because the ORP:W is out of date and arguably toothless in relation to allocation of water from the Lindis River. In particular, it does not give effect to the (later) NPSFM so consideration of PC5A at least enables us to make management of the Lindis River less inconsistent with that national policy statement.

[134] On the second question, the evidence for the ORC is that we should actively consider some of the water permit evidence when considering PC5A. Dr Cowie, author of the Section 87F Report, said that PC5A[124]:

> ... cannot be evaluated effectively without the associated [s 87G application]. It is only by comparing how [the application] will affect flows and the duration of those flows in different reaches of the river, that any comparative analysis can be made of the actual effects of the flow regimes proposed.

Ms Baker-Galloway submitted that Dr Cowie is wrong[125]. It appears that Fish and Game considers that PC5A should be resolved first (apparently without referring to the evidence on the application for water permits at all) because that would[126] ensure all

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123 *Sustain our Sounds Inc v New Zealand King Salmon Company Limited* (2014) 17 ELRNZ 520; [2014] 1 NZLR 673; [2014] NZSC 40 at [146].

124 B Cowie rebuttal evidence [34] [Environment Court document 46A].

125 Fish and Game closing submissions [26] [Environment Court document 59].

126 *SOS* above n 123 at [26].

legislative requirements in respect of the plan change were complied with and would provide a backstop if the LCG application was granted but not implemented or varied.

[135] A similar issue[127] arose in *SOS*. The question was "... whether it was improper for the Board [of Inquiry] to take into account the consent conditions when deciding on a plan change"? In effect, the Supreme Court answered "No"[128] but Glazebrook J did add a cautionary note[129] when delivering the court's decision:

> We recognise that there could be dangers when a planning authority has regard to anticipated consent conditions where the consents are for only one activity, while the plan change covers a variety of activities. A planning authority must have regard to the full range of activities that a proposed plan change could subsequently permit.

[136] In this case we consider we need to consider the section 87G application if only because the more detailed scenarios (including conditions) enable more accurate assessment of the options. We should decide the appeal on PC5A first in the light of all the evidence but bearing in mind both the Supreme Court's caution and that consideration of all the evidence for the application for a suite of water permits leads to the possibility of context bias (specifically framing bias) which we will need to guard against.

4.2 The role of the court on a plan appeal

[137] The role of the Environment Court on an appeal relating to a plan (change) is rather awkwardly set out in two places in the RMA. In the code which is Schedule 1, clauses 14 and 15 Schedule 1 govern the jurisdiction and procedure of the court, and clause 16(1) is the only provision in the Schedule that refers to the outcome of an appeal. It states:

> A local authority must, without using the process in this schedule, make an amendment to its proposed policy statement or plan that is required by section 55(2) or by a direction of the Environment Court under section 293.

[138] Despite that it is generally accepted that section 290 RMA applies and is the principal power of the Environment Court even on plan appeals. Section 290 RMA

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127 *SOS* above n 123 at [145].
128 *SOS* above n 123 at [145].
129 *SOS* above n 123 at [147].

states:

> **290 Powers of court in regard to appeals and inquiries**
>
> (1) The Environment Court has the same power, duty, and discretion in respect of a decision appealed against, or to which an inquiry relates, as the person against whose decision the appeal or inquiry is brought.
>
> (2) The Environment Court may confirm, amend, or cancel a decision to which an appeal relates.
>
> (3) The Environment Court may recommend the confirmation, amendment, or cancellation of a decision to which an inquiry relates.
>
> (4) Nothing in this section affects any specific power or duty the Environment Court has under this Act or under any other Act or regulation.

[139] In the recent decision *Darby Planning Limited Partnership v Queenstown Lakes District Council*[130] ("*Darby*") on appeals on a plan change the Environment Court stated:

> Our exercise of those powers, duties and discretions is as a judicial body in the determination of appeals, not as a planning authority with executive functions. QLDC is that planning authority. We are limited to matters that are reasonably and fairly raised in the PDP, submissions and appeals (subject to the discretion in s293). [underlining added]

We have some difficulties with that passage. First it is puzzling that the Environment Court feels obliged to remind itself it is not carrying out an executive function whereas (it claims) the local authority is. Clearly the Environment Court does not carry out executive functions. But the local authority's functions are not simply executive either. Important parts of the preparation of a regional or district plan are a (subordinate) legislative and quasi-judicial process not an executive one. That process is set out in the Schedule 1 code. The local authority can (or must) produce reports, which is an executive function, but it must also in due course make decisions. The exercise of its substantive functions and powers is not an "executive" function in the constitutional sense.

[140] As for the second sentence in the quoted passage from *Darby* we consider that is an over-simplification. With respect, the Environment Court's powers are not quite

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130 *Darby Planning Ltd Partnership v Queenstown Lakes District Council* [2019] NZEnvC 133 at [31]. The underlined words are a quotation from the decision of the High Court in *Waimea Residents' Assn Inc v Chelsea Investments Ltd* HC Wellington M616/81, 16 December 1981, where the Chief Justice wrote of the High Court "The Court is not itself a planning authority with the executive functions appropriate to identifying and evaluation possible sites". This passage has been cited by the High Court many times in a wider and different context, for example in *Mawhinney v Auckland Council* (2011) 16 ELRNZ 608 (HC) at [111].

so limited as *Darby* suggests. That decision[131] refers to the discretion in section 293 RMA but does not say when it might be relevant. In our view, the limits of the court's jurisdiction are given by provisions (and some matters) that are[132]:

(a) clearly stated in a proposed plan (or change); or

(b) reasonably and fairly raised in a submission on the provision or matter;

(c) either raised in an appeal which complies with clause 14(1) Schedule 1; or

(d) "matter(s) ... relating to any consequential alterations necessary to the proposed ... plan arising from the submissions"[133]; or

(e) which are "any other matter ... relevant to the proposed ... plan arising from the submissions"[134].

The section 293 supplementary power is relevant here, principally to resolve fairness issues since (d) and (e) arguably go beyond (a)-(c).

4.3 The lists in section 61 and section 62 RMA

[141] As a preliminary point we note that there is some confusion in the RMA over the purpose of a regional plan (other than a regional coastal plan). Section 63 of the Act states:

> **63 Purpose of regional plans**
>
> (1) The purpose of the preparation, implementation, and administration of regional plans is to assist a regional council to carry out any of its functions in order to achieve the purpose of this Act.
>
> (2) Without limiting subsection (1), the purpose of the preparation, implementation, and administration of regional coastal plans is to assist a regional council, in conjunction with the Minister of Conservation, to achieve the purpose of this Act in relation to the coastal marine area of that region.

At first sight all the functions of a regional council as set out in section 30 RMA are relevant.

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131 *Darby* above n 130 at [31].

132 See *re Vivid Holdings Limited* [1999] NZRMA 467 (NZEnvC) at [19].

133 Clause 10(2)(b)(i) Schedule 1 RMA.

134 Clause 10(2)(b)(ii) Schedule 1 RMA.

[142] However, section 65(1) reads:

> **65 Preparation and change of other regional plans**
>
> (1) A regional council may prepare a regional plan for the whole or part of its region for any function specified in section 30(1)(c), (ca), (e), (f), (fa), (fb), (g), or (ga)
>
> ...

The purpose of a regional plan – other than a regional coastal plan – here seems limited to the specified functions.

[143] That apparent inconsistency does not matter in this proceeding because at least two relevant functions in section 30(1) are listed in section 65 RMA. They are:

> ...
>
> (e) the control of the taking, use, damming, and diversion of water, and the control of the quantity, level, and flow of water in any water body, including —
>
> (i) the setting of any maximum or minimum levels or flows of water:
>
> (ii) the control of the range, or rate of change, of levels or flows of water:
>
> (iii) ...
>
> ...
>
> (ga) the establishment, implementation, and review of objectives, policies, and methods for maintaining indigenous biological diversity:

[144] Curiously, integrated management of resources (under section 30(1)(a) RMA) is not included as one of the relevant functions of a regional council when preparing (or changing)[135] a regional plan. That suggests section 65(1) could usefully be omitted from the RMA because it adds nothing useful to the description of a regional council's powers. It cannot be intended by Parliament that integrated management of resources is not a purpose of regional plans for two reasons: first, section 63 implicitly includes integrated management by referring to all a regional council's functions; second, a regional plan must give effect to[136] any regional policy statement, and the purpose of the latter is[137]:

> ... to achieve the purpose of the Act by providing an overview of ... policies and methods to achieve integrated management of the natural and physical resources of the whole region.

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135 Section 65(1) RMA.

136 Section 65(6) RMA and section 67(3)(c) RMA.

137 Section 59 RMA.

[145] The court has previously listed its obligations on a plan appeal for territorial authorities in cases such as *Eldamos Investments Limited v Gisborne District Council*[138], and *Long Bay-Okura Great Park Society Inc v North Shore City Council*[139] (updated in *Colonial Vineyard Limited v Marlborough District Council*[140]).

[146] Section 67 lists the requirements as to what a regional plan must (and may) contain. The only essential substantive requirements are a statement of objectives, policies and rules, and that a regional plan must also record how a regional council has allocated[141] a natural resource under section 30(1)(fa) or (fb) or (4), if the Council intends to do so.

[147] We consider that the role of the court on appeal, bearing in mind its primary role under section 290 RMA and its complementary role under section 293, is that with reference to the matter[142] or provisions[143] in issue – or provisions that are logically connected[144] to those – the court's duty is to determine which option (the Council's decision version[145] or that raised in the notice of appeal or other relevant options) is the better (or best if more than one appeal) after considering the obligations in sections 66 to 71 RMA.

[148] We consider that listing matters – or some of them – as 'whether' questions (see *Reiher v Tauranga City Council*[146] relied on in *Quieter Please (Templeton) Incorporated v Christchurch City Council*[147]) is not sufficient because that does not allow consideration (to use the generic word in the heading of section 66 RMA) of the judgements of degree about the importance of, and of the inter-relationships between, each of the relevant matters.

[149] In *Darby* the Environment Court stated[148]:

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138 *Eldamos Investments Limited v Gisborne District Council* (EnvC) W 047/2005.
139 *Long Bay-Okura Great Park Society Inc v North Shore City Council* (EnvC) A78/2008 at [34].
140 *Colonial Vineyard Limited v Marlborough District Council* [2017] NZEnvC 55 at [17].
141 Section 67(5) RMA.
142 Clause 14(1)(c) Schedule 1 RMA.
143 Clause 14(1)(a), (b) and (d) Schedule 1 RMA.
144 If raised under the court's section 293 jurisdiction.
145 Under clause 10 Schedule 1 RMA.
146 *Reiher v Tauranga City Council* [2012] NZEnvC 121 at [10].
147 *Quieter Please (Templeton) Incorporated v Christchurch City Council* [2015] NZEnvC 167 at [27].
148 *Darby* above n 130 at [23].

> Through s290, we also inherit the following further powers, duties and/or discretions, but within the above-noted parameters of our appellate function:
>
> (a) to be satisfied the PDP properly accords with the matters in s74(1), as to QLDC's s31 functions, pt 2, and the relevant RMA instruments;
>
> (b) to be satisfied that the PDP complies with the relevant content specifications in s75 and that the relevant provisions fulfil their statutory purposes;
>
> (c) to be satisfied that the PDP duly gives effect to relevant national policy statements and the operative regional policy statement ('RPS');
>
> (d) to have regard to relevant instruments specified in s74(2), including the presently proposed RPS provisions ('pRPS') and to take into account any relevant planning document recognised by an iwi authority;
>
> (e) to duly consider s32 RMA ...
>
> [footnotes omitted]

[150] While the point about the Environment Court acting within the parameters of its appellate function is well-made (if obvious)[149], on reflection we consider that much of the *Darby* list is a little strongly stated. In general, to be "satisfied" has an inflexible ring, whereas in our view the judgment is an exercise in relative assessments: the test is to compare the appeal proposal with the decision appealed. The approach in *Darby* appears to imply there is an onus on the appellant to "satisfy" the court as to the provision it is putting forward. That is not consistent with the long-established authority of *Hibbit v Auckland Council*[150] which established that:

> In references [appeals] under the [RMA] of provisions of proposed district plans, no onus rests on the appellant to establish that the subject provision should be deleted, the proceedings being more in the nature of an inquiry into the merits in accordance with the statutory objectives and existing provisions of policy statements and plans; nor is there a presumption that the provisions of the proposed plan are correct or appropriate: see K A Palmer *Local Government in New Zealand* adopted by the Planning Tribunal in *Leith v Auckland City Council*[151].

[151] Our other views on the list in *Darby* are (following its alphabetised order) that:

(a) should be expressed as that the appeals proposed for the plan (change) better accords with the listed matters than the status quo (i.e. the local authority's decision) or any other relevant alternative; further it needs to be read, in relation to Part 2 RMA, in the light of the principle in

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149 Although we have expressed doubt above about *Darby's* views of the limits on those powers.

150 *Hibbit v Auckland Council* [1996] NZRMA 529 (PT) at 535.

151 *Leith v Auckland City Council* [1995] NZRMA 400 (PT).

Environmental Defence Society Incorporated v New Zealand King Salmon Limited ("*King Salmon*")[152] that usually there should be no need to have recourse to Part 2;

(b) the first part of (b) is a purely formal requirement: we are doubtful that the Environment Court would ever have to check that a proposed plan contains objectives, policies or rules. Rather the substantive issue is whether they contain objectives, policies and rules that achieve (in sum) the purpose of the Act; the second part of (b) is too vague (with respect) to be useful;

(c) we agree, with the reservation about the use of the word 'satisfied', that a district plan must give effect to relevant national policy statements and an operative RPS;

(d) we agree with the *Darby* formulation in respect of having regard to the relevant intermediate statutory instruments;

(e) the Environment Court must apply or comply with[153] section 32 not merely "consider" it. It is the outcome of the section 32 evaluation which must be considered. The court must make a comparative examination of objectives under section 32(1)(a) and decide which is the "most appropriate". It must also examine whether the proposals are the most appropriate way to achieve the objectives with a "... level of detail that corresponds to the scale and significance of the ... effect ... anticipated from the implementation of the proposal"[154]. That evaluation then becomes one of the matters to be "considered". Indeed section 7(b) RMA makes the efficiency analysis a matter to which particular regard is to be had.

We also note that the list is incomplete: in that it does not refer to the important legislative duty "to not have regard to trade competition"; nor does it refer to the obligations in section 75(4) for district plans not to be inconsistent with any relevant WCO or relevant regional plan.

[152] The RMA has been amended since a number of those decisions. Further, those lists were as to a territorial authority's obligations not the subtly different ones of the

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152 *Environmental Defence Society Incorporated v The New Zealand King Salmon Limited* [2014] NZSC 38; [2014] NZLR 593 NZRMA 195; (2014) 17 ELRNZ 442 at [151].

153 Section 66(1)(e) RMA.

154 Section 32(1)(c) RMA.

Environment Court on appeal from a decision by a regional council. We now update our understanding of the latter.

[153] We note that while the heading to section 66 refers to the matters to be "considered" by a regional council the text of the section imposes differing obligations on it. The most important of these is the obligation in section 66(1) to prepare and change (as here) its regional plan "in accordance with ..." the list of obligations that follows. "In accordance with" may mean "in a way that agrees with" or "in a way that implements, follows or complies with". In the present context the phrase means the latter since a regional plan is either subordinate to the documents or instrumental in achieving the obligations listed in section 66(1) RMA.

[154] No doubt there are sundry ways to formulate the rather complex shopping list of matters to be considered by the court on an appeal about a plan (change). We hold that a useful summary is to ask:

> Which option for the challenged provision when read in the context of any relevant unchallenged provisions in the regional plan (change):
>
> A. Better overall:
>
> (1) **carries out**[155] the regional council's functions[156]; and
>
> (2) **agrees or complies** with the provisions of Part 2 (so as to achieve the purpose of the Act) if that is necessary because:
>
> (a) either the provision is an **objective**; or
>
> (b) because the provision implements objectives or policies which are incomplete, uncertain or illegal[157]; and there is no relevant intermediate statutory document which remedies the defect; and
>
> (3) **follows**[158] any direction given under section 25A(1) RMA;
>
> (4) **complies**[159] with any regulations; and
>
> (5) **give[s] effect**[160] **to** (and accords with[161]) any national policy statement, the New Zealand Coastal Policy Statement, national planning standard and any regional policy statement; and

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155 Section 66(1)(b) RMA.

156 Under section 30 RMA.

157 Applying *King Salmon* above n 152 at [90].

158 Section 66(1)(c) RMA.

159 Section 66(1)(f) RMA.

160 Section 67(3) RMA.

161 Section 66(1)(ea) RMA (added by section 55 Resource Legislation Amendment Act 2017 (so technically this is not relevant to this proceeding).

(6) is **not inconsistent with**[162] any other regional plan for the region or a water conservation order; and

(7) (a) **has regard to** any proposed regional policy statement[163], any relevant management plans and strategies prepared under other Acts[164]; any relevant entry on the New Zealand Heritage List/Rārangi Kōrero[165]; various fisheries regulations[166], and consistency with the regional policy statements and plans or proposed regional policy statements and proposed plans of adjacent regional councils[167];

(b) **takes into account** any relevant planning document recognised by an iwi authority[168] or a document prepared by a marine customary title group[169]; and

(c) **does not have regard** to (ignores) trade competition[170]; and

B. Either:

(a) (if an objective) is a more appropriate way than the specified alternatives to achieve the purpose of the Act[171] (having particular regard to[172] any existing evaluation); or

(b) (if the challenged provision is a policy) better **implements** the relevant objectives; or

(c) (if the challenged provisions are methods or rules) better **implements** the relevant policies[173]; and

C. (if a rule) better **has regard to**[174] the actual or potential effect (in particular any adverse effect) of activities on the environment.

[155] In our view the court "merely" needs to decide which of the challenged options before it, when read in context, better achieves the relevant objectives overall after the matters in the lengthy lists in Part 5 (sub-part 3) of the RMA, as summarized in the previous paragraph, have all been weighed together. This integrated judgment is a subjective exercise. It can be assisted greatly by the independent and more objective evaluation of efficiency under section 32 RMA if that is carried out with sufficient detail and comprehensiveness.

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162 Section 67(4) RMA.
163 Section 66(2)(a) RMA.
164 Section 66(2)(c)(i) RMA.
165 Section 66(2)(c)(iia) RMA.
166 Section 66(2)(c)(iii) RMA.
167 Section 66(2)(d) RMA.
168 Section 66(2A)(a) RMA.
169 Section 66(2A)(b) RMA.
170 Section 66(3) RMA.
171 Section 32(1)(a) RMA.
172 Section 66(1)(e) RMA.
173 Section 67(1)(b) and (c) RMA.
174 Section 68(3).

[156] Some plan changes do stand on their own: they have their own objectives and policies and must be assessed[175] largely[176] without regard to the other objectives and policies of the plan being changed[177]. However, other plan changes may be contemplated by an operative plan and may not contain any additional objectives and policies of their own. In this latter case, there is an extra suite of matters to be considered in addition to those listed in sections 66 and 67 RMA: the objectives and policies of the operative plan, which is why we outlined the (complex) scheme of the ORP:W in Chapter 3.

The irrelevant and relevant considerations in this proceeding

[157] We identify the specific relevant considerations shortly. A number of the matters listed above are irrelevant because:

- there is no direction from the MFE under section 25A(1) RMA;
- there are no relevant regulations;
- the New Zealand Coastal Policy Statement does not apply;
- there is no relevant national planning standard (although we discuss a draft national environment standard briefly);
- there is no relevant other regional plan for Otago or adjacent regions for PC5A to be inconsistent with, nor is there a relevant water conservation order;
- no change to any objective is proposed by PC5A.

[158] Parts of the planning framework which are relevant[178] to PC5A, and which we will refer to as necessary, are:

(a) the Kāi Tahu ki Otago Natural Resource Management Plan 2005;
(b) the Te Rūnanga o Ngāi Tahu Freshwater Policy 1999;
(c) the Sports Fish and Game Bird Management Plan for Otago 2015-2025;

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175 Under section 65 RMA (regional plans) or section 73 RMA (district plans).
176 The function of integrated management will often be an issue (section 30(1)(a) – regional councils; section 31(1)(a) – territorial authorities).
177 See *Appealing Wanaka Inc v Queenstown Lakes District Council* [2015] NZEnvC 139 at [37].
178 Section 66(2A) RMA: this requires a regional council to take into account any relevant planning document recognised by an iwi authority, to the extent that its content has a bearing on the resource management issues of the region.

and

(d) the Otago Conservation Management Strategy 2016.

[159] The Kāi Tahu ki Otago Natural Resource Management Plan 2005 contains a planning framework which informs the reader of Kāi Tahu ki Otago's natural resource management policies. The kaupapa of the plan is "Ki Uta Ki Tai" (from the Mountains to the Sea), which emphasises holistic management of the interrelated elements within and between catchments, from the air and atmosphere to the land and the coastal environment. Chapter 5 (Otago Region) and Chapter 10 (Clutha/Mata-au catchments) are particularly relevant to PC5A. The Ngāi Tahu Freshwater Policy Statement outlines Kāi Tahu's association with freshwater, the environmental outcomes sought by Kāi Tahu in relation to freshwater, and the means by which Kāi Tahu, as tangata taiki, is seeking to work with resource management agencies to achieve these outcomes.

[160] We must also have regard to the Commissioners' Decision[179].

4.4 <u>According with Part 2 of the RMA</u>

[161] There are a number of issues we should deal with briefly here:

(1) to what extent should we refer to Part 2 RMA in this proceeding?
(2) what is 'life-supporting capacity' in section 5(2)(b) RMA?
(3) if we need to look at them, what are the relevant provisions in section 7? (this issue is considered in subchapter 4.5);
(4) what is the relationship between sections 5 to 8 RMA?

To what extent should we refer to Part 2 RMA in this proceeding?

[162] The first question is to what extent we should refer to Part 2 given the existence and relevance of the NPSFM. The leading authority on this issue is *King Salmon*[180]. There the Supreme Court was concerned with the relationship between a plan change and a higher order statutory instrument that post-dated and therefore was not given effect to in the operative district plan. The national policy statement in question was the New Zealand Coastal Policy Statement 2010 ("the NZCPS"). For the majority,

179 Section 290 RMA.
180 *King Salmon* above n 152.

Arnold J stated[181]:

> ... the NZCPS gives substance to pt 2's provisions in relation to the coastal environment. In principle, by giving effect to the NZCPS, a regional council is necessarily acting "in accordance with" pt 2 and there is no need to refer back to the part when determining a plan change. There are several caveats to this, however, which we will mention shortly.

[163] The "caveats" were identified in a later passage where Arnold J stated[182]:

> ... it is difficult to see that resort to pt 2 is either necessary or helpful in order to interpret the policies, or the NZCPS more generally, absent any allegation of invalidity, incomplete coverage or uncertainty of meaning. The notion that decision-makers are entitled to decline to implement aspects of the NZCPS if they consider that appropriate in the circumstances does not fit readily into the hierarchical scheme of the RMA.

The principle established by the Supreme Court is that, absent invalidity, incomplete coverage or uncertainty of meaning in the intervening statutory documents, there is usually no need to look at Part 2 of the RMA, at least on a plan change. We will consider the application of this principle later.

What is safeguarding the life-supporting capacity of ecosystems?

[164] The issue of the life-supporting capacity of ecosystems arises at all levels[183] of the hierarchy of statutory instruments relevant to this case, so it is worth setting out our understanding of the phrase used in section 5(2)(b) RMA. We agree with Dr Hayes that "...life-supporting capacity operates as a continuum"[184], Mr Logan submitted that "Any flow may ... safeguard life-supporting capacity"[185] and pointed out that even the status quo option sustains a trout fishery. The ORC's approach is a common one but we consider its understanding of "life-supporting capacity" is oversimplified.

[165] Supporting life is a qualitative matter. For generalist introduced omnivorous or predatory species such as humans, magpies, mynahs, dogs, cats or trout the life-supporting capacity of ecosystems is treated as if a plentiful supply of oxygen and water is all the species need because they can help themselves to food and the other

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181 *King Salmon* above n 152 at [85].
182 *King Salmon* above n 152 at [90].
183 Section 5(2)(b) RMA; Objective A1 NPSFM; Objective 6.3.1 of ORP:W.
184 Transcript (2018) p 465 lines 8-9.
185 ORC closing submissions at [309] [Environment Court document 61].

essentials of life. But safeguarding the life-supporting capacity of many ecosystems – including those containing New Zealand's endemic biologically diverse biota – is a much more complex matter than supply ensuring they have "enough" air or water.

[166] Section 5(2)(b) RMA refers to "life-supporting capacity". The word used is "capacity" not "ability". The latter is a qualitative word, whereas capacity is both qualitative and quantitative. It is not merely the ability of (in this case) water to support life which is to be protected, but the volume of water in any given factual matrix.

[167] Further, section 5(2)(b) RMA needs to be read in the context of the Act as a whole, particularly with section 6(c) RMA and the description of the functions of local authorities in relation to indigenous biodiversity. The Environment Court attempted to summarise the scheme of Part 2 of the RMA with respect to indigenous biodiversity in *Director-General of Conservation v Invercargill City Council*[186]:

> [Several] points should be made here about the scheme of the RMA in relation to indigenous biodiversity. First, the primary responsibility of local authorities when exercising their functions in respect of indigenous biodiversity is part of the very definition of "sustainable management": to safeguard the life-supporting capacity of ecosystems.
>
> Second, the recognition and protection of areas of significant indigenous vegetation, nationally important as it is, is an extension of that primary obligation. If an ecosystem or part of an ecosystem (being in either case an area of indigenous vegetation or a habitat of indigenous fauna) is found to be significant then that ecosystem is to be protected in itself, not merely to have its life-supporting capacity protected.
>
> Third, safeguarding (or protecting) the life-supporting capacity of ecosystems includes in each case having particular regard to each of its components including – as the definition of 'intrinsic values'[187] implies … its biological and genetic diversity, and in particular, the essential (biotic and abiotic) characteristics of:
>
> - the ecosystem's integrity (e.g. what space does it occupy at a given time? Is an occurrence at the limit of the ecosystem's extent of occurrence?);
> - its form (what are the characteristics of its environment – the geomorphology, topography, soils, climate, indigenous and other species of flora and fauna, patterns of distribution, natural processes and other relevant constituents identified in the definition of "environment" in s 2 RMA;

186 *Director-General of Conservation v Invercargill City Council* [2018] NZEnvC 84 at [45]-[47].
187 Section 2 RMA.

- its functioning (e.g. is it a seral or 'climax'[188] ecosystem? What are the external processes that apply to it? – climate change? pests? weeds? How are the natural cycles and feedback loops – the Carbon, Nitrogen, Phosphorus cycles and others – being changed?); and
- Its resilience (e.g. at what point is a degraded ecosystem irretrievably doomed to "collapse" or can it recover?).

...

[168] It is also worth noting that ecosystems are incredibly complex and that the descriptive pigeonholes ('integrity', 'form', 'functioning', 'resilience') as used in section 2 RMA are (still) often over-simplistic despite their apparent sophistication. Further, ecosystems may be nested or may overlap. These complexities make translating protection of indigenous biodiversity into policies (and under other instruments, rules) very difficult.

[169] Generally it is sufficient to assess future states of the environment against the present (the status quo), but in certain situations involving safeguarding the life-supporting capacity of an ecosystem it is often important to look back at the 'state' of the ecosystem at an earlier time (e.g. pre-European or pre-human); in some cases it may be essential to benchmark against earlier periods. For example, in relation to the species of most interest to humans (ourselves) the concentration of CO_2 in the atmosphere is usually benchmarked against pre-industrial levels of about 280 parts per million ("ppm")[189]. Because of our ignorance of what is sufficient to protect indigenous species in modified ecosystems it is often important to assess their previous un-modified ecosystems or at least their state at an earlier point in time[190].

4.5 <u>What are the (potentially) relevant provisions in section 7 RMA?</u>

[170] Fish and Game is adamant that we need to consider section 7 RMA which provides a list of other matters to be had particular regard to. We consider these later for reasons we will explain.

[171] However it is worth recording at this point that one of the matters to which

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188 'Climax' was placed in inverted commas because the court explained that idea of an endpoint for ecosystems which are inherently dynamic is probably incorrect.

189 It reached 400 ppm in about 2013: the planet is now heading towards non-life-supporting levels.

190 Bland L M and others *Guidelines for the application of the IUCN Red List of Ecosystems* Version 1.1 (2015) IUCN, Gland (Switzerland). This uses a 50 year assessment period in addition to historical (since 1750) changes.

particular regard is to be had under section 7(d) RMA is the intrinsic values of ecosystems (as defined in section 2 RMA). In *Oceana Gold (New Zealand) Limited v Otago Regional Council*[191] ("*Oceana Gold*") the court described[192] as useful the evidence[193] of two witnesses on ecological integrity:

> [111] Ms Myers wrote that ecological integrity is a key component of maintaining biodiversity and is defined as "containing the full potential of indigenous biotic and abiotic features, and natural processes, with functioning sustainable communities and habitats". This includes maintaining the full suite of indigenous plants and animals being present in a region or district together with the key ecosystem functions and processes that sustain functional relationships.
>
> [112] Dr Lloyd referred to an "ecological integrity framework" as a useful basis for considering what elements of indigenous biodiversity need to be maintained. He described components of the 'ecological integrity' framework as:
>
> - species occupancy (to avoid extinctions). Are the species present that you would expect?
> - indigenous dominance (to maintain natural ecological processes). Are the key ecological processes maintained by native biota?
> - ecosystem representation (to maintain a full range of ecosystems). Are the full range of ecosystems in New Zealand protected somewhere?[194]
>
> (footnotes from original decision omitted)

[172] Our conclusion from this is that not all ecosystems are equal. While the whole ecosystem that is Aotearoa/New Zealand is of paramount importance to humans, that is too general to be useful in specific cases. Instead the RMA concentrates on indigenous biodiversity and the smaller nested ecosystems that it lives in. We mention this because it appears to us that the intrinsic (as opposed to human use) values of ecosystems which do not contain trout are often of higher value than those of ecosystems which do. The presence of trout debases the integrity of ecosystems of indigenous fauna and flora.

[173] Two other provisions in section 7 are particularly relevant.

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191 *Oceana Gold (New Zealand) Limited v Otago Regional Council* [2019] NZEnvC 41. This decision is subject to appeal.

192 *Oceana Gold* at [113].

193 *Oceana Gold* at [111] and [112].

194 The quotation was corrected in [2019] NZEnvC 122.

- *The protection of the habitat of trout and salmon*[195]
  Fish and Game placed considerable emphasis on section 7(h) RMA. We accept that 'protection' is a strong word, equivalent to 'safeguard'. However, as we noted in Part 4.3, the section 7 matters are to be had 'particular regard to', not ensured.
- *The effects of climate change*
  We are obliged to have particular regard to the effects of climate change[196]. This is potentially important in these proceedings because it appears the subordinate statutory instruments are all incomplete on this issue.

4.6 The National Policy Statement on Freshwater Management

[174] Of relevance to PC5A, section 67(3)(a) of the RMA states that a regional plan must give effect to the NPSFM.

[175] The objectives of the NPSFM are relevant in this case, but only a few of the policies. That is because the ORC resolved[197] just before commencement of the hearing to implement a "Progressive Implementation Programme" in accordance with Section E of the NPSFM. That means many policies[198] of the NPSFM are no longer required to be given effect to in the court's decision on PC5A.

[176] All objectives of the NPSFM relating to water quality are potentially still directly relevant[199] to determination of PC5A, to the extent they can be sensibly applied (if they are dependent on terms that are tied up with implementation of the NPSFM's policies, their application may be limited).

[177] In relation to setting a minimum flow the relevant provisions of the NPSFM are Objectives B1 to B3 and Objective B5[200]. Objective B5 seeks to enable communities to provide for their economic wellbeing in sustainably managing freshwater quantity. However, this is to be done 'within limits'. Those limits are set under:

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195 Section 7(h) RMA.

196 Section 7(i) RMA.

197 Progressive Implementation Programme adopted 31 October 2018.

198 Policies AA1, A1, A2, A3, A5, A6, A7, B1, B2, B3, B4, B5, B6, B8, C1, C2, CA1, CA2, CA3 and CA4.

199 Policy E1 does not provide the ability to defer implementation of the objectives of the NPSFM.

200 Objective B4 is not relevant because the Lindis River has not been identified as an 'outstanding' freshwater body.

- Objective B1 – which seeks that the life-supporting capacity, ecosystem processes and indigenous species (including their associated ecosystems) of freshwater be safeguarded; and
- Objective B2 – which is to avoid any over-allocation and phase out existing over-allocation;
- Objective B3 – to improve and maximise efficient allocation and use of water.

We will consider how these objectives are best (i.e. most appropriately) given effect to in our evaluation below. At this point there are two aspects of the objectives we should draw attention to.

[178] The first is that Objective B1 is to safeguard (amongst other things) indigenous species. This is an important objective because it appears to go some way towards resolving the ambiguities in Part 2 of the RMA, especially in section 5(2)(b) and section 7 of the Act, which we have drawn attention to as to the inequality of ecosystems. The objective does not give a definitive answer to the status of non-indigenous freshwater species but it definitely gives primacy to safeguarding the ecosystems of indigenous species.

[179] However, the grammar of Objective B1 is difficult to understand especially since there is no direct implementing policy. It appears to require the safeguarding of:

(a) the life-supporting capacity of freshwater;
(b) the ecosystem processes of freshwater; and
(c) indigenous species and their associated ecosystems of (in) freshwater.

Objective B1 of the NPSFM does not integrate neatly with the RMA in relation to the management of freshwater ecosystems. For example, while section 5(2) RMA refers to ecosystems, Objective B1 refers to "ecosystem processes" which are presumably a component of ecosystems. The word "processes" is not explained, whereas in the RMA itself "intrinsic values" of ecosystems[201] are defined in section 2 RMA as meaning:

201 Which are to be had particular regard to under section 7(d) RMA.

> **intrinsic values**, in relation to ecosystems, means those aspects of ecosystems and their constituent parts which have value in their own right, including—
>
> (a) their biological and genetic diversity; and
>
> (b) the essential characteristics that determine an ecosystem's integrity, form, functioning, and resilience

[180] As for Objective B2, which is to avoid over-allocation and phase out existing over-allocation, "over-allocation" and "limit" are defined as meaning:

> **"Over-allocation"** is the situation where the resource:
>
> (a) has been allocated to users beyond a limit; or
>
> (b) is being used to a point where a freshwater objective is no longer being met.
>
> This applies to both water quantity and quality.
>
> **"Limit"** is the maximum amount of resource use available which allows a freshwater objective to be met.

There are no limits in the NPSFM in relation to water quantity, so it may refer to limits in subordinate regional plans. We consider the references in (a) and (b) of the definition of "over-allocation" are to objectives in both the NPSFM itself and in regional plans.

[181] In relation to the first definition of over-allocation, since a "limit" in the NPSFM includes a limit in a (regional) plan we need to consider the allocation limits in the ORP:W. As we have recorded, the way this works is that whether the (notional) limit is set at 1,200 l/s (under 900 MF option) or at 1,640 l/s (under the 550 MF option) the actual limit under Policy 6.4.2 will continue to be 3,248 l/s until all the existing permits expire – or are surrendered. As permits are surrendered the allocation limit will move down to, or at least close to, the limit set by this decision. Either way there is neither at present, nor is there likely to be in the reasonably foreseeable future, over-allocation (in the "beyond a limit" sense of the NPSFM) in the Lindis River's mainstem.

[182] The second meaning of over-allocation is where a freshwater objective (under the NPSFM) is not being met. This of course depends on the other objectives.

[183] The objectives for freshwater quality and quantity in the NPSFM include safeguarding the life-supporting capacity, ecosystem processes and indigenous species including their associated ecosystems[202], and protection of the significant

202 NPSFM Objectives A1 and B1.

values of wetlands and of outstanding freshwater bodies[203].

[184] The word "value" is defined in the NPSFM to include any national value[204], and the latter are described in Appendix 1 of the policy statement. The national values include "ecosystem health" which is further illustrated as follows[205]: "In a healthy freshwater ecosystem ecological processes are maintained, there is a range and diversity of indigenous flora and fauna, and there is resilience to change".

[185] Introduced species like trout and other salmonids are not directly safeguarded. The only express reference to fishing in the NPSFM is to "Fishing" in Appendix 1 where it is listed as an "other national value" for freshwater management units (another term introduced by the NPSFM) if the unit supports fisheries of species fish are allowed to be "caught and eaten".

[186] Appendix 2 of the NPSFM provides guidance on water quality and ecosystem state for lakes and rivers using numerical indicators as well as narrative descriptions including "healthy" and "resilient".

[187] As for efficiency under Objective B3 we discuss that in Chapter 7 of the Reasons.

4.7 The Otago Regional Policy Statement and some conclusions

[188] The Regional Policy Statement for Otago ("the PORPS") was publicly notified on 23 May 2015 and appeals on the RPS are in the process of being resolved. It became partly operative on 14 January 2019. Chapter 1 ("Resource management in Otago is integrated") recognises that the integrated management of natural and physical resources and human values is essential to safeguard the life-supporting capacity of the environment and enable the social, cultural, and economic wellbeing of all people and communities.

[189] Chapter 3 "Otago has high quality natural resources and ecosystems" begins with the recognition and maintenance of all natural resources, and then focuses on the

203 NPSFM Objectives A2 and B4.
204 NPSFM p 10.
205 NPSFM p 26.

identification, protection and enhancement of natural resources that are nationally or regionally important. The provisions relating to fresh water, water allocation and use, and water shortage are particularly relevant. Another relevant policy is 3.1.3 ("Water allocation and use"). This reads:

> Manage the allocation and use of fresh water by undertaking all of the following:
>
> a) Recognising and providing for the social and economic benefits of sustainable water use;
>
> b) Avoiding over-allocation, and phasing out existing over-allocation, resulting from takes and discharges;
>
> c) Ensuring the efficient allocation and use of water by:
>
> i. Requiring that the water allocated does not exceed what is necessary for its efficient use;
>
> ii. Encouraging the development or upgrade of infrastructure that increases efficiency;
>
> iii. Providing for temporary dewatering activities necessary for construction or maintenance.

[190] Policy 3.1.3 of the PORPS is to manage the allocation and use of freshwater by recognising and providing for the social and economic benefits of sustainable water use; avoiding over-allocation and phasing out existing over-allocation; and ensuring the efficient allocation and use of water[206]. "Over-allocation" is not defined in the PORPS, and therefore should bear the meaning in the NPSFM discussed above.

[191] Chapter 4 contains a Policy 4.2.2 as to climate change which reads:

> **Policy 4.2.2 Climate Change**
>
> Ensure Otago's people and communities are able to mitigate and adapt to the effects of climate change, over no less than 100 years, by all of the following:
>
> a) Taking into account the effects of climate change, including by using the best relevant climate change data;
>
> b) Applying a precautionary approach when assessing and managing the effects of climate change where there is scientific uncertainty and potentially significant or irreversible effects;
>
> c) Encouraging activities that assist to reduce or mitigate the effects of climate change.
>
> d) Encouraging system resilience.

206 Consent memorandum version dated 6 July 2018. Confirmed in decision [2019] NZEnvC 42 (which is remarkably under appeal).

Conclusions from the statutory instruments

[192] Mr Logan submitted[207] that there are seven key conclusions from the Act and the planning instruments:

> (1) planning takes place within the legal parameters set by the Act, the NPSFM, the Regional Policy Statement, Proposed Otago Regional Policy Statement and the settled provisions of the Regional Plan: Water;
> (2) a "*no takes*" environment is not envisaged by the Act or any of the subordinate planning instruments;
> (3) the Act and subordinate planning instruments recognise and provide for continued abstraction, within limits;
> (4) a river with no abstraction (except for domestic use and stock water) is not the [only] benchmark for the plan change;
> (5) abstraction is subject to constraints that safeguard life-supporting capacity of water, and maintain natural character and aquatic ecological values, with priority being given to indigenous species[208];
> (6) in decisions under the Act about water takes, existing values must, as a minimum, be maintained; and
> (7) in decisions under the Act, there may be requirements for enhancement of the current environment to achieve specific objectives and policies.

With the addition of the bracketed word[s] we generally accept that submission.

[193] Mr Logan further submitted[209] that the existing environment as defined in *Ngāti Rangi*[210] for the purposes of section 104 is irrelevant in the plan change process and rather it is the environment as it exists and is seen and experienced now which is to be managed in accordance with and to achieve the objectives and policies of the relevant instruments and the purpose of the Act. We do not agree entirely with that. While we agree the NF option is not the only, and not the most important, option to be considered, it is still relevant under the ORP:W as we have shown.

4.8 Sections 32 and 32AA identification of the options to be considered

[194] As we have recorded, a further set of obligations[211] on a local authority when

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207 ORC closing submissions at [144] [Environment Court document 61].
208 Through section 6(c) RMA and Objective B1 NPSFM.
209 ORC closing submissions [145] [Environment Court document 61].
210 *Ngāti Rangi* above n 117.
211 Section 32(1)(c) RMA.

preparing a plan (change) is the section 32 evaluation. On an appeal[212] about a plan change, the Environment Court has the same duty[213] that the regional council has to evaluate the plan change under section 32. Section 32 states:

> **32 Requirements for preparing and publishing evaluation reports**
>
> (1) An evaluation report required under this Act must—
>
> (a) examine the extent to which the objectives of the proposal being evaluated are the most appropriate way to achieve the purpose of this Act; and
>
> (b) examine whether the provisions in the proposal are the most appropriate way to achieve the objectives by—
>
> (i) identifying other reasonably practicable options for achieving the objectives; and
>
> (ii) assessing the efficiency and effectiveness of the provisions in achieving the objectives; and
>
> (iii) summarising the reasons for deciding on the provisions; and
>
> (c) contain a level of detail that corresponds to the scale and significance of the environmental, economic, social, and cultural effects that are anticipated from the implementation of the proposal.
>
> (2) An assessment under subsection (1)(b)(ii) must—
>
> (a) identify and assess the benefits and costs of the environmental, economic, social, and cultural effects that are anticipated from the implementation of the provisions, including the opportunities for—
>
> (i) economic growth that are anticipated to be provided or reduced; and
>
> (ii) employment that are anticipated to be provided or reduced; and
>
> (b) if practicable, quantify the benefits and costs referred to in paragraph (a); and
>
> (c) assess the risk of acting or not acting if there is uncertain or insufficient information about the subject matter of the provisions.
>
> (3) If the proposal (an **amending proposal**) will amend a standard, statement, regulation, plan, or change that is already proposed or that already exists (an **existing proposal**), the examination under subsection (1)(b) must relate to—
>
> (a) the provisions and objectives of the amending proposal; and
>
> (b) the objectives of the existing proposal to the extent that those objectives—
>
> (i) are relevant to the objectives of the amending proposal; and
>
> (ii) would remain if the amending proposal were to take effect.
>
> (4) If the proposal will impose a greater prohibition or restriction on an activity to which a national environmental standard applies than the existing prohibitions or restrictions in that standard, the evaluation report must examine whether the prohibition or restriction is justified in the circumstances of each region or district in which the prohibition or restriction would have effect.
>
> (5) The person who must have particular regard to the evaluation report must make

212 Under clause 14 of the First Schedule to the RMA.

213 Section 290(1) RMA.

the report available for public inspection—

(a) as soon as practicable after the proposal is made (in the case of a standard or regulation); or

(b) at the same time as the proposal is publicly notified.

(6) In this section,—

objectives means,—

(a) for a proposal that contains or states objectives, those objectives:

(b) for all other proposals, the purpose of the proposal

proposal means a proposed standard, statement, regulation, plan, or change for which an evaluation report must be prepared under this Act

provisions means,—

(a) for a proposed plan or change, the policies, rules, or other methods that implement, or give effect to, the objectives of the proposed plan or change:

(b) for all other proposals, the policies or provisions of the proposal that implement, or give effect to, the objectives of the proposal.

[195] The efficiency analysis under section 32 RMA requires us to compare the net social benefits[214] of the various options as to the proposed minimum flows and primary allocations. We must also analyse the risks of acting (changing the minimum flow) or not acting (confirming the Commissioners' Decision).

[196] The evaluation (under clause 5(1) Schedule 1) must[215] summarise the reasons for deciding on the provisions and contain a level of detail[216] proportionate to the scale and significance of the effects of the proposal.

Identifying the reasonably practicable options for achieving the objectives

[197] The Resource Management Amendment Act 2013 attempted to clarify the evaluation procedure by specifying that as a preliminary step in the section 32 evaluation it is necessary to identify the "reasonably practicable options". Usually, the options to be compared under section 32 are the existing situations on the ground (or in the water) "the status quo"; the decision being appealed; and the proposed relief in the notice of appeal. The 2013 amendment to section 32 made explicit what was implicit before, that the provisions promoted by a proposal need to be compared with "the reasonably practicable options". Amongst other questions that raises in turn, is

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214 *Federated Farmers of NZ Inc v Mackenzie District Council* [2017] NZEnvC 53 at [458] (Eleventh Decision).

215 The "evaluation" is required by clause 5(1)(a) Schedule 1 RMA.

216 Section 32(1)(c) RMA.

when does the assessment of what is a "reasonably practicable option" have to be made? Obviously it would be useful if the assessment could be made early so that irrelevant options did not have to be considered. But equally obviously it is important not to make premature judgements.

[198] We consider that the status quo is almost always to be regarded as a "reasonably practicable option" because it exists: it is the situation on the ground or in the water at the time of the hearing. Persons making evaluations under section 32 should be careful to avoid precluding the existing situation (especially if it is greenfields or clear water) as a reasonably practicable option by proponents arguing that the cost of the resource (e.g. land) is so high that the status quo cannot remain. What is reasonably practicable should not be defined by speculative capital costs or (usually) by the financial viability of a proposal. The former issue does not arise in this case (much of the capital costs have already been incurred some time ago and it was for plant and machinery not land). As for the latter, this case may be special since it is largely for "renewals" of existing deemed water permits.

[199] In this case we have identified the obvious reasonably practicable options (they are also listed in Table 3.1) as being:

(a) the operative ORP:W with a primary allocation (limit) of 3,777 l/s and no minimum flow ("the Status Quo");
(b) PC5A as notified;
(c) the Commissioners' decision version of PC5A ("900 MF");
(d) the appellant LCG's proposal ("550 MF");
(e) 'Naturalised' flows ("the NF option").

[200] We received no evidence on (b) so consider it no further. A more complex issue is the extent to which we should consider (e) the NF option. The LCG and the ORC submitted the assessment is against naturalised flows in the existing physical context; i.e. in a farmed catchment and with existing structures.

[201] Ms Baker-Galloway submitted that in deciding the appropriate minimum flow and primary allocation we should compare the effects of water takes under the various scenarios against the naturalised flows of the river. She said that on a plan change (or new plan) the test is of the effect of activities on the environment as if there was no abstraction from the river. She referred to two resource consent decisions. The

authoritative decision is *Ngāti Rangi Trust v Manawatu-Whanganui Regional Council*[217] ("*Ngāti Rangi*") where the High Court endorsed *Port Gore Marine Farms Ltd v Marlborough District Council*[218] ("*Port* Gore") in which the Environment Court stated:

> ... we need to bear in mind that we must imagine the environment ... as if the three marine farms are not actually in it.

[202] We do not find it necessary to determine whether *Ngāti Rangi* might apply in the absence of any policy because in relation to "natural character", Policy 5.4.8 ORP:W expressly directs us to have particular regard to a list of features of rivers (including lakes). It states:

> **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.

Ms Baker-Galloway emphasised the recurrence of the word "natural" in factors (b), (c) and (d), but did not mention the phrase "use and development" which applies to <u>all</u> the preceding factors nor did she mention that the state of use and development is expressly to be considered.

[203] The correct approach under this policy is that, when considering adverse effects on rivers under the ORP:W, there are two (opposing) sets of factors:

> (1) the natural flow and the naturalness of other physical characteristics; and
> (2) the extent of use and development

— with a further set in the middle:

> (3) the current ecosystem(s) of the river.

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217 *Ngāti Rangi* above n 117.
218 *Port Gore Marine Farms Ltd v Marlborough District Council* [2012] NZEnvC 72 at [140].

So under the plan we must have particular regard to naturalised flows, conditions and ecosystems and to the extent to which use and development has influenced them. That entails we should consider both the NF option and the Status Quo option.

[204] One aspect of the NF option to bear in mind is that while "natural flows" can – subject to the effects of climate change described in Part 1 of this decision – be restored, the ecosystem that went with it cannot because trout cannot practically be removed from the mainstem of the river. Situations where it is important to assess effects on "natural values" against a naturalised background do occur under the RMA. For example, it is very difficult to assess whether the life-supporting capacity of a modified ecosystem is being safeguarded (protected) without making some assessment of its earlier pre-anthropogenic state, but this proceeding is not one of them at least as far as the mainstem of the Lindis River is the subject of concern.

[205] So when we come to consider not simply the high "natural value" of eels, but the Lindis River as eel habitat, we may need to consider natural flows and water quality. However, the same cannot be said, or at least not within anything like the same force, of trout since from an ecological point they are an introduced pest (albeit one with special status under section 7 RMA).

[206] Accordingly, we consider that the most important benchmark, when considering natural values for the Lindis River, in relation to the effects of take on the ORP:W's schedule 1A is the current state of the river (recognising the artificiality of describing any ecosystem as being in a 'state' since ecosystems are sets of dynamic processes).

[207] In particular we consider that for trout the important baseline comparison is with the status quo. That is because there is no such thing as a "natural state" for trout in New Zealand. Compared with the Status Quo option both the 550 MF option and 900 MF Option will not merely avoid adverse effects on the presence of trout, but are likely to increase the number of fish (and their size). Both options for taking of water are effective in implementing the policy. We will also have particular regard to the fact that the NF option would provide a rainbow for anglers by creating an ecosystem which is likely to produce more and larger trout.

4.9 Is a draft National Environmental Standard on Ecological Flows and Water Levels relevant?

[208] Fish and Game referred to the proposed National Environmental Standard on Ecological Flows and Water Levels ("the draft NES"). The draft NES proposes to set interim limits on the alteration to flows and/or water levels for rivers, wetlands, and groundwater systems that do not have limits imposed through regional plans or Water Conservation Orders. In particular, it proposes:

- default minimum flow of 80% of MALF; and
- an allocation limit of whichever is the greater of 50% MALF or the total allocation from the catchment.

[209] What weight, if any, should be afforded to the draft NES? The draft NES does not have any status as a statutory document. The Environment Court in *P & E Limited v Canterbury Regional Council* ("*P & E*") stated[219]:

> In the end the assessment of the effects of the proposed take on the fauna and ecosystem(s) of the Cass River depend on whose evidence we prefer. Counsel for P & E submitted we should prefer the opinion of Mr Jowett because of his "... direct involvement with the preparation of the Draft Guidelines and his overall conservative approach in terms of assessing the [MALF]". The first reason places too much weight on a document that has no statutory significance and which contains proposed limits that Dr McIntosh and, he says, other ecologists, do not agree with. The second reason is dubious because neither Dr McIntosh nor Dr Meredith regarded the take as conservative. Further, even on its own terms the P & E take, at 39 to 40% of MALF is right at the limit. As Mr Maw submitted the draft NES describes a take exceeding 30% of MALF as "having a high degree of hydrological alteration".
> (footnotes omitted)

[210] The Environment Court added that[220]:

> P & E also placed far too much weight on the *Draft Guidelines* [for the Selection of Methods to Determine Ecological Flows and Water Level]. That document has no legal status, so setting low flow limits for the Cass River on what is contained in it should be given very little weight especially given the doubts Dr McIntosh expressed about it when cross-examined.

219 *P & E Limited v Canterbury Regional Council* [2016] NZEnvC 252 at [195].
220 *P & E* at [265].

[211] Ms Baker-Galloway submitted[221] that the evidence before the court in this case enables us to place some weight on the draft NES. The guidance provided by the proposed NES was also discussed in the evidence of Dr Dunn[222]. Dr Hayes said that guidance on flow alteration in respect of setting limits for aquatic life is given in the draft NES. Cross-examined Dr Dunn stated[223]:

> In my evidence, I say that guidance is provided on minimum flows, and that draft national environment standards on flows and water levels, and I'll emphasis the word "guidance" and it is for minimum flows not residual flows. That's what, and when you have the values in that draft NES are interim and they apply in the absence of actual data. So, you would default to those if you don't have actual hydrological data. For some streams, or some of the tributaries, we do have actual data, or synthesised data, and so we acknowledge that the time period that that's been collected over is quite short, and we've made a judgement call between the model and 25 recorded, or actual data.

[212] We consider we should eschew any reliance on the proposed NES for three reasons. First there is sufficient guidance in the statutory documents we must consider; conversely there is no obligation to consider the draft NES so it could be considered as irrelevant; third there is no mention in the NES (or if there is, nobody drew it to our attention) of the ambiguous status of salmonids: on the one hand the protection of their habitat is a matter to which particular regard is to be had; and on the other their presence degrades indigenous ecosystems (as in this case where trout have extirpated some indigenous fish for the main stem of the Lindis River).

5. Predicting the future hydrological characteristics of the Lindis River

5.1 Introduction to the scenarios exemplifying the options

[213] The point of setting a primary allocation (and a minimum flow) is to set the limits for possible takes of water from the Lindis River. When considering the taking of water from a river, Policy 6.4.0 ORP:W requires us to recognise the hydrological characteristics of the river and the options for taking water, particularly in relation to:

(a) the levels and flows of [the river being a] surface water bod[y]; and
(b) the levels and volumes of groundwater; and
(c) any interrelationship between [them].

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221 Fish and Game closing submissions at [111] [Environment Court document 59].
222 N R Dunn evidence-in-chief [49] to [54] [Environment Court document 43.
223 Transcript (2019) p 248 lines 16-26.

Accordingly, we now set out the figures as to current flows and the predictions as to future flows under the different options – principally the 550 MF and 900 MF options identified in Table 3.1.

[214] The hydrologists who gave evidence for LCG and ORC were Mr R D Henderson, Ms C Houlbrooke, Dr D A Olsen and Mr M A Hickey. The only other expert hydrologist was Mr J H Rekker, called by Fish and Game. Some ecological experts with hydrological expertise attended hydrological conferencing and their attendance is noted where relevant.

[215] Data from the Lindis River flow recorders were used to generate hydrographs of the naturalised annual flows past those points over time, and to portray the de-watering effects of various "scenarios". It needs to be borne in mind that a scenario only represents one of many possible ways that the options we have described can be realised.

[216] The scheme of the ORP:W – as set out in Chapter 3 – is obviously an important part of this case. There are aspects of that scheme we should draw attention to here because they frame the case in general and the scenarios put forward by the parties in particular. Three important components of the ORP:W are:

(1) that its minimum flow is simply a flow at one transect[224] of the relevant river;
(2) that the ORP:W contemplates rationing regimes set up through a "water management group" or a "water allocation committee"[225];
(3) that any subsequent application for a water permit to take water ("a take") is a fully discretionary activity[226].

These matters entail that the minimum flow and primary allocation will in practice be only parts – albeit important ones – of the operating conditions for water permits to take from the Lindis River which will be set by the application of (2) and (3).

[217] In the context of this case, (1) means that the minimum flow contemplated by

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224 A line across the river at the Ardgour FR or strictly, since velocity is a relevant variable, over a short length (usually about 6 metres) of the river downstream of that line.
225 Policy 6.4.12B ORP:W.
226 Rule 12 ORP:W.

PC5A for insertion into the ORP:W simply sets a flow at the Ardgour FR, 3.7 kms upstream from the Clutha/Mata-Au confluence. The ORP:W is neutral as to where water is taken from so long as the minimum flow at the Ardgour FR is 900 l/s or 550 l/s (or whatever figure is set in this proceeding). A consequence of components (2) and (3) of the ORP:W's scheme is that to make predictions about the effect of the competing options assumptions need to be made about other aspects of particular flow ("rationing") regimes, and about what conditions might (reasonably) be imposed on water permits. Due to different assumptions by the witnesses a plethora of scenarios was identified. We are unimpressed by this multiplicity: it confused the witnesses themselves, counsel and the court.

[218] The scenarios differ from each other in relation to three principal variables: the source of take – either races (surface water take) or galleries (groundwater take from aquifers) – minimum flow and the method of calculating the maximum take. We have used those three variables to standardise the names of the scenarios because there was a bewildering variety of names attributed to the scenarios put forward.

[219] We have endeavoured to standardise our descriptions above by attributing, for each of the three minimum flow options, a name to each scenario that explains whether it is a galleries or races scenario and gives the minimum flow and total take.. For reasons we explain later, some of the scenarios are more relevant to the Water Permits' application and will therefore be considered in more detail in our second decision. Some scenarios of minor importance – usually variations on others as to methods of calculating rates of take – are not referred to at all. The most relevant scenarios and their relationships to the *options*[227] are shown in Table 5.1 (noting that our standardised names are **emphasised** in italics (in the second column):

227 Described in Table 3.1.

Table 5.1 Flow regime options and scenarios

Option	Scenario names	Method of calculating maximum take	Tributary takes l/s[228]	Mainstem takes l/s	Total take l/s
Naturalised Flow	***Naturalised Flow***[229] optimised dryland[230]	N/A	Nil	Nil	Nil
Status Quo (current regime)	***Status Quo***[231]	Maximum measured instantaneous daily mean rate of take	248	2,007	2,255
	Status quo[232] variant	Sum of consented primary allocation rates of take	419	3,221	3,640 (3,777)
550 MF	***Galleries 550/1639*** (Gallery)[233]	As per LCG appeal	—	—	1,639
	Galleries 550/1364 (Future Galleries)[234] or (FG)	As per LCG appeal but calculated as assessed maximum consented rate (for galleries) and maximum measured instantaneous daily mean rate (for the tributaries).	248	1,116	1,364
	Galleries 550/3640 (Future Galleries maximum)	Sum of consented takes	419	3,221	3,640 (3,777)
900 MF	***Races 900/1200*** (PC5A (DV)[235, 236]	Primary allocation from Commissioners' Decision	—	—	1,200
	Races 900/2255 (Future Races) or (FR)[237]	Maximum measured instantaneous daily mean rate of take	248	2,007	2,255
	"Galleries 900/1200"[238]				1,200
	Galleries 900/1364 (Future Galleries 900)[239] (PC5A/PA 1200)[240]	Assessed maximum consented rate (galleries) and 65% of maximum measured instantaneous daily mean rate of take (tributaries).	248	1,116	1,364

[220] We summarise the more important scenarios for this proceeding below. Different witnesses used different names for the sundry scenarios so the evidence became very confusing. Compounding these difficulties is that even within their own evidence witnesses were not consistent[241] as we shall see. Even Mr Henderson's "comparison of scenario terminology"[242] in his rebuttal evidence is not useful. First, he refers to primary allocations rather than the modelled take rates in his final column, and

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228 All figures in bold in the final three columns are derived from R D Henderson evidence-in-chief Table 5 [Environment Court document 9].

229 C Houlbrooke evidence-in-chief [46A] called this the river's "Natural State" [Environment Court document 8]; Fish and Game calls it "the existing environment".

230 R A Mudge evidence-in-chief [35] [Environment Court document 26].

231 R D Henderson evidence-in-chief Table 5, row 5 (note: this is not the same as "FG" with nominal 1,639 l/s rate of take) [Environment Court document 9].

232 R D Henderson at 9.1 and Table 5 row 2 [Environment Court document 9].

233 C Houlbrooke evidence-in-chief 13 [Environment Court document 8] and Transcript (2018) pp 126-127.

234 R D Henderson evidence-in-chief [47] and Table 5 row 5 "Future Galleries with 550 [l/s] minimum" [Environment Court document 9].

235 C Houlbrooke evidence-in-chief [8.3] [Environment Court document 8].

236 This was variously called "PC5A", "PC5A (900/1200)" and "PC5A (PA1200)".

237 R D Henderson evidence-in-chief Table 5, row 4 [Environment Court document 9].

238 Fish and Game's Galleries alternative to *Races 900/1200*.

239 R D Henderson evidence-in-chief Table 5, row 6 "Future Galleries with 900 [l/s] minimum"; para 47 [Environment Court document 9].

240 JWS(H) [Exhibit 8.2].

241 See for example R D Henderson rebuttal evidence Table 1 [Environment Court document 9A].

242 R D Henderson rebuttal evidence Table 1 [Environment Court document 9A].

second, he did not know where the table comes from[243].

The Naturalised Flow option

[221] The Naturalised Flow option is practically straightforward – the only abstraction is 50 l/s for stock and domestic use. To call this an "option" is slightly misleading because no party to this proceeding has sought a primary allocation of zero l/s. However, it is relevant under the ORP:W and many witnesses discussed it.

The Status Quo option

[222] There is only one important scenario for this option, the *Status Quo* scenario. It is based on the measured volume of water taken from the Lindis River in the 2014/15 and 2015/16 years using existing intake and irrigation infrastructure[244]. 2015 was "moderately dry" while 2016 was "extremely dry"[245].

[223] The take rate of 2,255 l/s caused some confusion. It is the maximum actual take recorded on a single (unidentified) date, i.e. the maximum measured instantaneous (daily mean) rate of take. It is used because none of the existing water takes are subject to a minimum flow restriction. The figure (2,255 l/s) needs to be distinguished from the figures representing the sum of consented primary allocation takes (variously given as 3,777 l/s 3,640 l/s and 3,248 l/s[246]).

[224] Ms Baker-Galloway submitted in closing[247] that 2,255 l/s is each consent's maximum instantaneous take (taken at different points in time) then each of these totalled. As just explained, that is not so. 2,255 l/s is the maximum instantaneous daily rate of take upstream of the Ardgour Road FR site[248]. That *status quo variant* which sums the consented maximum take[249] for all primary takes upstream of the Ardgour FM (and thus represents the concept Ms Baker-Galloway articulated) is of no relevance for reasons we explain later.

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243 Transcript (2018) p 167 lines 24-27.

244 C Houlbrooke evidence-in-chief [8.1] [Environment Court document 8].

245 Transcript (2018) p 144 line 11 to p 145 line 14.

246 Transcript (2018) pp 121-122; see also JWS(H) Table 5.1, Attachment 3 [Exhibit 8.2].

247 Otago Fish and Game closing submissions [42] [Environment Court document 59].

248 Agreed statement of facts; Table 5, p 19; and transcript (2018) p 146, line 29 to p 147, line 4; p 189, line 10 to p 191, line 6.

249 There is slight variation in the figure used – it varies between 3,640 and 3,777 l/s – but the difference is immaterial.

The 550 MF option

[225] The *Galleries 550/1639*[250] scenario is based on a 550 l/s minimum flow as measured at the Ardgour FR and a primary allocation water take of 1,639 l/s using the proposed new gallery intake system (it also includes flushing flows of 1000 l/s when the flow at the Ardgour FR is at or below 700 l/s for 14 days). This is the scenario proposed by LCG's appeal and resource consent applications described in Chapter 1.

[226] There is a significant error about scenario *Galleries 550/1639* (and others) in Ms Baker Galloway's closing submissions. She wrote "it is worth noting that neither the scenarios ... nor the modelling ... illustrates the cumulative effect of the LCG consents, with other non-LCG consents in the catchment (such as Oaktree)[251]". That is wrong. The figure of 1,639 l/s (the primary allocation for Lindis Catchment proposed by LCG) includes consents held by non-LCG members, including a company called Water Company Ltd ("Oak Tree"). As explained earlier those consents total approximately 300 l/s. 219 l/s of that is not being replaced by LCG's application for water permits but is nevertheless within the LCG water[252]. Non-LCG members had 91 l/s of the allocation[253]. Oak Tree is included as a tributary take from Wainui Creek at its maximum existing rate of take of 37 l/s (which is both the maximum rate recorded take and the rate for which Oak Tree has applied for a new consent) for Future Races and Galleries[254]. It is part of the 3,248 l/s and 1,639 l/s figures referred to in Table 5.1.

[227] The slightly different *Galleries 550/1364* (Future Galleries) is based on the *Galleries 550/1639* with the primary allocation recalculated. This is the LCG's preferred scenario on the evidence and represents its application for water permits considered in the second proceeding. The recalculation is based on:

- actual measured instantaneous daily mean rates for tributaries;
- an assessed[255] proportion of the maximum 'consented' rate through galleries.

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250 C Houlbrooke evidence-in-chief [8.2] [Environment Court document 8].

251 Otago Fish and Game closing submissions at [47] [Environment Court document 59].

252 As shown in Environment Court document 2.1 handed up by LCG's counsel at the beginning of the hearing.

253 Document 2.1.

254 JWS(H), Attachment 3, Table 5.1 and Attachment 4; statement of rebuttal evidence of C Houlbrooke, Table 5.1; see also document 2.1.

255 R D Henderson evidence-in-chief at [47] and Table 5 Line 5 [Environment Court document 9]; M A Hickey evidence-in-chief at [41] [Environment Court document 10].

The assumption made in this calculation is that the galleries will operate much closer to the maximum consented rate than the races currently do.

[228] The "actual" total take of 1,364 is rather less than the primary allocation of 1,639 l/s. This model is conservative because at 1,364 l/s the annual volume applied for by LCG (19M m^3) would be abstracted within 161 days of the commencement of the irrigation season, i.e. by 10 March. It is worth noting here that much of the evidence and indeed the modelling referred to in this decision refers to the 1639 l/s primary allocation. The *Galleries 550/1639* and *Galleries 550/1364* scenarios were also discussed somewhat interchangeably in the evidence and hearing transcript – but both relate to the LCG proposal described[256] in Chapter 1. As the hearing progressed it was often difficult for us to determine which of those two primary allocations was being referred to. Where we are still uncertain we have referred to the *Galleries 550/1639* scenario or simply to the 550 MF option. There is so little difference in practice that it does not affect our reasoning.

[229] *Galleries 550/3640* was referred to by Fish and Game as showing that at low flows (in dry years) at Lindis Peak FR, if flows were taken at the maximum rate, the first important adverse effect of a 550 l/s minimum flow is to cause significantly lower flows from The Point down to Ardgour FR than any of the scenarios exemplifying a 900 MF option[257]. Second, it has very low flows (100 l/s at the confluence) for quite sustained periods compared with any of the scenarios exemplifying the 900 MF option. This scenario is of no relevance to this decision for the reasons given in Chapter 3. However, we will discuss the detail in the WPs decision because it is probably relevant there.

The 900 MF option

[230] *Races 900/1200* is the decision version of PC5A ("PC5A (DV)"). This is based on a primary allocation of 1200 l/s of water being taken from the Lindis catchment using existing intake and irrigation infrastructure (i.e. the races), and of course a 900 l/s minimum flow measured at the Ardgour FR. Although one of the most relevant comparisons is between *Galleries 550/1639* and this scenario, there was no modelling done of *Races 900/1200*. To assess the 900 MF option, the JWS(H) simply used

256 At [18].

257 See the longitudinal hydrographs for naturalised flows of: 1068 l/s on 31 March 2016; 925 l/s on 13 March 2016.

35%[258] of *Galleries 550/1639* as an approximation for the PC5A (DV) scenario, but of course this does not show the flow pattern in the river that would result from a races scenario.

[231] *Races 900/2255* was put forward by LCG/ORC to illustrate what might happen if the 550 MF option was not chosen by the court. It shows that if water continues to be taken out of the Lindis River through the three large races, that is, from much higher up the river than in the galleries scenarios, then there will be significantly less water in the reaches below the Tarras Race intake (at 24 kilometres above the Clutha/Mata-Au confluence) down to the Ardgour FR. Only below the Ardgour FR (approximately) would flows under *Races 900/2255* remain higher than those under FG, and then only at input flows (at Lindis Peak FR) less than somewhere between 1,531 l/s and 1068 l/s.

[232] The figure of 2,255 l/s was used in the Status Quo scenario because it is based on actual recorded data. That is unexceptionable in our view as a real exemplification of the Status Quo option. The reason for using that figure in the *Races 900/2255* scenario is more contentious. It uses a possible flaw in the ORP:W's definition of "primary allocation". The logic behind the use of the figure 2,255 l/s in this scenario appears to be this:

(1) the LCG relies on the fact that the primary allocation, as defined, is the greater of the notional figure set by this decision – and for present purposes it does not really matter whether that is 1,200 l/s or 1,640 l/s – and the sum of existing consents (which is somewhere between 3,248 or 3,777 l/s depending on whether one uses the sum of actual maximum takes (on different days) or simply the consented total);

(2) *Races 900/3248* relies on those figures, but even the LCG concedes that water permits are unlikely to be granted for these volumes if that primary allocation was confirmed;

(3) the LCG has reduced the input figure for the primary allocation in its *Races 900/2255* scenario from the sum of existing consents to the maximum taken on a specific date under the status quo scenario, which is why the figure 2,255 l/s recurs;

(4) that take is a likely consequence of setting a higher minimum flow (900 l/s) and lower notional primary allocation.

258 JWS(H) at 13(a) [Exhibit 8.2].

[233] Ms Baker-Galloway submitted that in relation to Policy 6.4.2(b)[259]:

> LCG and ORC have promoted 2255 l/s as being relevant in the context to Water Plan Policy 6.4.2(b), being, allegedly, the sum of consented maximum instantaneous takes.

While this is not particularly important, it is not correct that LCG and ORC promoted 2,255 l/s as the sum of the consented maximum instantaneous takes or the primary allocation under Policy 6.4.2(b). The "correct" figure under Policy 6.4.2(b) of the ORP:W is 3,777 l/s. LCG considers that volume should be reduced to 3,248 l/s, which is the sum of the highest recorded instantaneous rates of take (at different times) for all of the individual water takes in the Lindis Catchment[260] (as shown for example in *Galleries 550/3640*). *Races 900/3248,* which uses the total primary allocation, as at the hearing date, as defined by the ORP:W, is an extreme version of *Galleries 550/3640*.

[234] *Galleries 900/1200* is the galleries version of *Races 900/1200* promoted by Fish and Game. Ms Baker-Galloway submitted[261]:

> This is the scenario Mr Rekker was asked to model as PC5A (PA 1200 l/s) with his synthetic model, and this is what is illustrated in the JWS Hydrology Attachment 3 as the lightest brightest blue line on the upper figure on each of the figures.

A problem with this scenario is that it is based on Dr Rekker's synthetic model described earlier. Because of the difficulties we identify below with that model we consider any longitudinal hydrographs based on it should not be relied on. That is important because Fish and Game built part of its case around it. Compounding Fish and Game's problems with that reliance is that it is not correct. Dr Rekker's synthetic model was not used in the joint witness statement of the hydrologists ("JWS(H)"). As the JWS(H) itself explains, "pro rata reductions were made to the Galleries scenario to model a different scenario called PC5A PA 1200 l/s"[262].

[235] *Galleries 900/1364* is a variant of the 900 MF option that uses the (downstream) gallery takes rather than races and adopts the actual maximum.

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259 Otago Fish and Game closing submissions [39] [Environment Court document 89].
260 Agreed statement of facts; see also Planners JWS [Exhibit 10.6].
261 Otago Fish and Game closing submissions [38(b)] [Environment Court document 59].
262 JWS(H) at [5] [Exhibit 8.2]. Also C Houlbrooke Transcript (2018) p 104, line 1 to p 106, line 10.

5.2 The assumptions and the hydrographs

[236] The court recognises the advantages of models, but the standard qualifications apply, including that:

- the quality of the input data should be scrutinised;
- all assumptions (e.g. as to rating curves to convert river level data to river flow) and inputs should be identified;
- the model should be calibrated;
- tests should be re-run, preferably independently;
- patch-ups should be identified (e.g. amendments of "rating curves");
- statements of "statistical significance"[263] and p-values[264] should be explained very carefully.

[237] The assumptions used to demonstrate the options were the "model inputs" [265] of the hydrologists. These were either recorded data, extrapolations, or further assumptions. Those in common to most of the scenarios are[266]:

(a) take rates:

(i) a flow rate of 132 l/s is taken from upstream of Lindis Peak. This volume was used for *Galleries 550/1639* and *Races 900/2255*, but there was a pro rata 35% reduction from this value within *Races 900/1200.*;

(ii) groundwater takes upstream of Ardgour FR were 59 l/s for *Galleries 550/1639* and *Races 900/2255* but a pro rata 35% reduction from this value within *Races 900/1200*;

(iii) groundwater takes downstream of Ardgour FR:

- 137 l/s for *Races 900/2255*;
- 147 l/s for *Galleries 550/1639*; and
- a pro rata reduction of 35% from 147 l/s within *Races 900/1200*;

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263 See (2015) *Basic and Applied Social Psychology* 37(1)1-29.

264 Wasserstein R L, Lazar N A *The ASA's Statement on p-values: context, process and purpose* (2016) AM Statistician 70(2):129.

265 JWS(H) [Exhibit 8.2].

266 JWS(H) at [3] [Exhibit 8.2].

(iv) take locations, volumes and methods of take were all based on "version 5 of the Master List"[267];

(b) as discussed above, various rationing methods were used:

- "flow sharing" – for *Galleries 550/1639* is based on a table[268] in Mr Hickey's evidence in order to give a predicted[269] flow of 550 l/s at the Ardgour FR:

Table 5.2 Rationing reductions to meet 550 l/s minimum flow

Lindis Peak flow (m^3/s)	reduction in maximum take %
1.6	25%
1.2	50%
0.9	75%

- rationing – for *Races 900/2255* and *Races 900/1200*, this is based on pro rata reductions to meet the minimum flow;
- flushing flow – the "flushing flow" regime to assist trout out-migration[270] was not modelled in any of the scenarios;

(c) variable tributary inflows – these are incorporated in the two longitudinal models.

[238] Mr Henderson is a very experienced hydrologist from NIWA who was called by the ORC and LCG. He showed flow profiles (hydrographs[271]) for *Galleries 550/1639* and *Races 900/2255* as flows past four river locations over time (October 2014 to May 2015 and October 2015 to May 2016). The locations were downstream of the Ardgour Race intake, downstream of the Rutherford's Race intake, downstream of the losing reach and at the Ardgour FR. We annex these to this decision as attachment "B", so that the reader can get a visual picture of the different flow regimes over time. It will be seen that the *Galleries 500/1639* scenario has higher flows than the *Races 900/2255* scenario to the (considerable) extent shown on the hydrographs.

[239] In fact, Mr Henderson analysed the frequency and duration of low flows (as shown in the hydrographs[272]) and the reliability of supply for irrigators. His flow

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267 JWS(H) at [3] Attachment 7 [Exhibit 8.2].

268 M A Hickey evidence-in-chief Table 5.1 [Environment Court document 10].

269 M A Hickey evidence-in-chief [57] [Environment Court document 10].

270 For example, downstream movement into the Clutha River/Mata Au.

271 R D Henderson evidence-in-chief Figures 12-15 [Environment Court document 9].

272 See Annexure 4 of the JWS(h) [Exhibit 8.2].

exceedance curves and durations for each scenario were endorsed by the other participants in the hydrology conferencing[273]. Mr Henderson was cross-examined[274] about these hydrographs and his figures but made no significant concession about them. Our confidence in their accuracy was not undermined despite two minor confusions:

- the ambiguities over the total flow taken in his flow profile for *Galleries 550/1364* (i.e. he appeared to profile model 1,364 l/s despite his earlier statement[275] that he would use the primary allocation take of 1,639);
- describing[276] *Races 900/1200* but in fact apparently analysing[277] *Races 900/2255*.

5.3 The agreed longitudinal model

[240] Because the standard hydrographs do not convey any information about the volumes of water in the river at points other than the Ardgour FR, another type of hydrograph – creating longitudinal profiles – was also modelled for a number of scenarios. These show the flow at a single point in time along the length of the lower river for a number of scenarios at specific flows as measured at the Lindis Peak FR.

[241] Although Mr Rekker gave evidence for Fish and Game he was initially contracted by the ORC in 2016 to carry out hydrological modelling on the Lindis River under the minimum flow and primary allocation regimes proposed. Mr Rekker produced a paper *Lindis River Longitudinal Hydrological Simulation*[278]. This model was based on flow records from the two permanent flow recorders (the Lindis Peak FR and the Ardgour Road FR) and from three additional flow recorders: "Clutha Confluence", "SH8" and what he called "Rutherford's" (at The Point), collected over the period 9 October 2014 to 30 April 2016. In addition, data was available from five tributary inflows and from metering or estimation of takes from the mainstem of the river. Inflows to and outflows from groundwater were estimated and agreed based on preliminary work by Dr Olsen as described in various papers by him.

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273 JWS(H) at [6] and [7], p 4.
274 Transcript (2018) p 173 from line 28.
275 R D Henderson evidence-in-chief [9.2] [Environment Court document 9].
276 R D Henderson evidence-in-chief [9.3] [Environment Court document 9].
277 R D Henderson Table 5 row 4 [Environment Court document 9].
278 J H Rekker *Lindis River Longitudinal Hydrological Simulation*, 3 January 2017.

[242] The model's output depends on the input for the points of take. This is important, because *Galleries 900/1200* and *Galleries 900/1639* assume gallery takes. Thus they differ significantly from *Races 900/1200*, *Races 900/2255* and *Races 900/3248* which assume takes from the three large water races.

[243] Mr Rekker described his original longitudinal model as synthesising the flow profile of the Lindis River main stem, integrating catchment flows, irrigation abstraction, and losses and gains to the aquifer. His method was as follows[279]:

> The river length was divided into 200 nodes, separated by an average 160 metres apart, making the model framework span 32 kilometres from the confluence to Lindis Peak flow monitoring site. Certain nodes along the flow profile were registered as inflow, abstraction, groundwater source / sink or flow measurement nodes according to the nodes' position along the profile.
>
> The longitudinal model was further discretised temporarily as 570 day-long time steps and mean daily flows or abstraction rates were defined to fill out the time series between the start and end dates of the simulation (9/10/2014 to [30/4/2016]. This encompassed two separate irrigation seasons (2014-15 and 2015-16), with an intervening winter lacking abstraction and comprising several fresh flows and a flood.

[244] Mr Rekker explained that[280] "the longitudinal model provided a limited ability to 'tune' or calibrate the model settings by attempting to replicate the measured or estimated water exchanges for the 570-day period encompassed in the simulation and comparing flows modelled at the four downstream flow measurement nodes (Rutherford's, Ardgour Road, SH8 and Clutha Confluence)". He summarised the point of his work in this way[281]:

> The main utility of the model [is that it] illustrat[es] ... the profile flow rates at each node along the river. Particular days within the 570 days of the simulation could be selected as illustrating an approximation of the flows along the lower river, such as coinciding with a specified management flow rate at Ardgour [FR].

[245] At an expert conference on 6 June 2017 the methods and findings of Mr Rekker's report were 'generally agreed' by the attendees, subject to further modelling

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279 J H Rekker evidence-in-chief [61]-[62] [Environment Court document 11].
280 J H Rekker evidence-in-chief [63] [Environment Court document 11].
281 J H Rekker evidence-in-chief [65] [Environment Court document 11].

to be carried out by Mr Rekker. Relying on that agreement Ms Houlbrooke then inserted figures into that longitudinal model to show the effects of different abstraction regimes on different inflows (from Lindis Peak FR to the Clutha confluence). She modelled scenarios from three options: the Status Quo, 550 MF and 900 MF. The Status Quo and 900 MF options were modelled using recorded data, so allocation limits were irrelevant[282]. An allocation limit, however, had to be applied to the 550 MF option with its 1639 l/s allocation. It is also worth noting that, in fact, Ms Houlbrooke initially modelled the full allocation[283] (unlike Mr Henderson who used Mr Hickey's "Assessed Maximum Consented Rate of Take" – *Galleries 550/1364*).

[246] For most purposes those three scenarios (and the NF option) are all that really need to be considered. However, we now turn to outline some other scenarios raised by the evidence.

5.4 Other longitudinal modelling

The maximum take scenarios

[247] As we have recorded, the first set of longitudinal profiles – "the original graphs" – used as input (for takes) the actual volume of water taken from the 2014/15 and 2015/16 irrigation seasons. However, after Fish and Game suggested that the correct figures for the takes should be the maximum volume that could have been taken, Ms Houlbrooke prepared new "maximum" longitudinal profiles[284].

[248] For the maximum models shown in the longitudinal profiles – the relevant scenarios with their abstraction "limits" used as inputs are:

- *Races 900/3248*;
- *Galleries 550/1639*; and
- *Galleries 900/1200* [285].

[249] We have outlined the 'maximum' scenarios here in part so that all the scenarios can be seen together – with their relationships to the options – as shown in Table 5.1.

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282 C Houlbrooke rebuttal [50] and [52]. [Environment Court document 8A].

283 C Houlbrooke rebuttal Table 1 [Environment Court document 8A] and Attachment 5 to JWS(H) [Exhibit 8.2].

284 C Houlbrooke rebuttal evidence [49] and [50] [Environment Court document 8A].

285 JWS(H) Attachment 3, Table 5.1 [Exhibit 8.2].

Further, at first sight it seems appropriate to assume that the total primary allocation as sought by the LCG would all be taken from the river at the same time, especially at low river flows because consent holders would attempt to maximise the benefits of their water permits. In drought conditions it is easy to envisage that all consent holders might attempt to exercise their take permits to the maximum at the same time. As counsel for the LCG acknowledged[286], that would be the standard practice in the absence of any constraints.

[250] At this point it is necessary to recall the scheme of the ORP:W and in particular that any application for a water permit is a discretionary activity. Thus any concerns about maximum takes at low flow causing adverse effects on, e.g. the ecosystems of the river, can be met by conditions imposed when discretionary consent is sought (and there are provisions for reaching agreement).

[251] Conversely, the court would not want to preclude the possibility of water takes simply because of fears of adverse effects which might be able to be avoided, remedied or mitigated. Consequently, we consider the maximum take scenarios are largely irrelevant to PC5A. They are more relevant to the water permits application and we will consider them in the decision on that.

[252] We find that the maximum theoretical take scenarios (i.e. setting them at the current primary allocation) for the 550 MF option are irrelevant if one of the set of scenarios which came under the 550 MF option is found to be the most appropriate option as a result of our section 32 evaluation of the options. That is an acceptable approach because of the fact that all applications for take are still discretionary under the ORP:W. One result of that status is that the ORC, as consent authority, can reject applications that seek to take primary allocations beyond the notional limit of 1640 l/s despite the fact that the "real" primary limit remains 3,777 l/s until October 2021 under Policy 6.4.2 of the ORP:W.

Mr Rekker's synthetic model

[253] Mr Rekker considered that the predictive capability of the longitudinal model further developed by Ms Houlbrooke was limited and he subsequently produced a new

286 LCG closing submissions [34] and [36] [Environment Court document 62].

"synthetic model" [287].

[254] There are major difficulties with Mr Rekker's synthetic model. First its different assumptions were not agreed in advance by the other hydrologists; second, it is not clear who instructed[288] it to be prepared; third and more importantly, there are various errors in its inputs as recorded at some length by Mr Henderson[289] and Ms Houlbrooke[290] in their rebuttal evidence, most of which were conceded by Mr Rekker[291]. Finally, it is superseded by the hydrologists' joint witness statement[292] (to which Mr Rekker is a signatory) which post-dates Mr Rekker's evidence[293]. Accordingly we give no weight to Mr Rekker's synthetic model (and the evidence based on it).

Ms Houlbrooke's further modelling

[255] For the last hydrological experts' conference Ms Houlbrooke produced further longitudinal profiles (our standard name followed by her name and descriptions):

- *Galleries 550/1364* – FG ("galleries"[294]) LCG's proposed water sharing and rationing regime (adjusted, this made its inputs the same as Mr Henderson's FG for his flow profiles);
- *Galleries 550/3640 – Future Galleries (maximum)* – this assumes the whole primary allocation is taken under the 550 MF option;
- *Races 900/2255 – Future Races (maximum)* – this assumes all the primary allocation is taken under the 900 MF option;
- *Galleries 900/1200* –this was derived from pro rata adjustment of *Galleries 550/1639* abstraction rates to reduce the total allocation from 1,639 l/s to 1,200 l/s[295].

[256] As we have already seen in relation to the *Status Quo*, the figure of 2,255 l/s – also used in *Races 900/2255* – caused some confusion in the longitudinal profiles. This

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287 J H Rekker evidence-in-chief [68]-[70] [Environment Court document 11].

288 Mr Rekker thought it was prepared at the request of Fish and Game's ecologists (Transcript (2019) p 260 line 20, p 261 line 17); but Mr N Watson said it was at his direction as Manager of Fish and Game's involvement in the two sets of proceedings. Transcript (2019) p 140 lines 6 to 14.

289 R D Henderson rebuttal evidence [12]-[22] [Environment Court document 9A].

290 C E Houlbrooke rebuttal evidence [24] [Environment Court document 8A].

291 Transcript (2018) pp 236 to 260.

292 Exhibit 8.2 dated 17-18 October 2018.

293 J H Rekker evidence-in-chief [Environment Court document 11].

294 "Galleries" was Ms Houlbrooke's term.

295 JWS(H) at [5] [Exhibit 82].

was compounded when Ms Baker-Galloway[296] wrote: "The Longitudinal Original Model illustrates the effect of what was actually taken, on a day in the past". That is incorrect. The longitudinal original model illustrates the effect of taking water in a manner similar to the past, but with allowance for the new gallery intakes at the rate of 390 l/s[297]. Ms Houlbrooke's evidence-in-chief shows abstraction from the galleries at an almost constant rate[298]. The 2,255 l/s is the maximum measured instantaneous daily mean rate of take upstream of Ardgour Road under the current regime[299]. It was not used in Ms Houlbrooke's model (as she stated in her oral evidence[300]) and is therefore irrelevant to the longitudinal profiles generated from the longitudinal modelling.

5.5 Duration of low flows

[257] As for the duration of low flows[301] under *Galleries 550/1364* we accept that:

- in the driest year there would be 39 consecutive days at 550 l/s and 106 days at that flow rate in total;
- for the 25th percentile there would be a 35-day run; and
- even in the median year there would be 18 consecutive days at 550 l/s.

[258] Dr Olsen agreed in cross-examination by Ms Baker-Galloway that compared with naturalised low flows, to have the river at 550 l/s for 106 days (of the irrigation season) in the driest year would be a "significant low flow event"[302] and Dr Jowett acknowledged[303] "... there's quite a high degree of hydrological alteration caused by these flow abstractions".

[259] However, comparison of the 550 MF option with the Naturalised Flow is only one of assessments we must make. Another is to compare the option with the Status Quo, and in this second comparison 550 MF represents a significant hydrological

296 Fish and Game closing submissions [49] [Environment Court document 59].
297 C Houlbrooke evidence-in-chief [32 and [36.1] and Table B1 [Environment Court document 8] and Transcript (2018) p 123 lines 11-18.
298 C Houlbrooke, evidence-in-chief, Figure 2, p 12; and see also Transcript (2018) p 123 lines 7-24 [Environment Court document 8].
299 Agreed statement of facts, Catchment Level Table of Key Parameters for Lindis Catchment, document 2.1.
300 Transcript (2018) p 122 lines 1-6.
301 JWS(H) Attachment 4.
302 Transcript (2018) p 336 line 19.
303 Transcript (2018) p 350 line 6.

improvement.

5.6 Natural variability in flows and the effects of climate change

[260] Mr Henderson reminded us that[304] "Natural flow variability occurs at all time scales, from individual flood events and the recessions following them, to seasonal, inter-annual and decadal". We have already described the seasonal flows. As for longer-term fluctuations Mr Henderson wrote[305]:

> Inter-annual variation is also significant, with individual years being nearly half as dry or more than twice as wet, as the long-term mean. These wet and dry years can occur in groups, sometimes influenced by Pacific-wide climate cycles such as El Nino/Southern Oscillation, on time scales of a few years or the Interdecadal Pacific Oscillation ["IPO"] over time scales of 20-30 years.
>
> In common with many other catchments of the lower South Island, the Lindis River exhibits the effect of the IPO fluctuations[306] notably a switch from one phase to another in 2000. Pre-2000, the mean flow at Lindis Peak Flow Monitoring Site was 6690 l/s (10% greater than the long-term mean), and post-2000 mean flow at Lindis Peak [FR] has been 5550 l/s (90% of the long-term mean).
>
> Low flows in the river have been similarly affected. The pre-2000 7-day MALF at Lindis Peak [FR] was 1740 l/s (15% greater than the long-term MALF), and the post-2000 7-day MALF at Lindis Peak [FR] has been 1270 l/s (84% of the long-term MALF) ...

Questioned by the court[307] Mr Henderson was more equivocal about the influence of the IPO, attributing the climate variability "in part" to the IPO and saying records for the IPO fluctuations have not been collected long enough for statistically strong conclusions to be drawn from the data. Nevertheless the data he presented demonstrated to us the large degree of variability in rainfall over time.

[261] Mr Henderson did not discuss the effects of climate change in his evidence-in-chief. In his rebuttal evidence[308] he said that the potential effects of climate change on

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304 R D Henderson evidence-in-chief [18] [Environment Court document 9].

305 R D Henderson evidence-in-chief [21]-[23] [Environment Court document 9].

306 McKerchar A I, Henderson R D (2003) *Shifts in flood and low-flow regimes in New Zealand due to interdecadal climate variations*, Hydrological Sciences Journal 48(4): 637-654.

307 R D Henderson Transcript p 141 line 19 – p 142 line 31.

308 R D Henderson rebuttal evidence [56] [Environment Court document 9A] responding to the evidence of Ms K M Hanan [Environment Court document 31].

water resources are an important issue but did not address them. Cross-examined he said[309]:

> ... as far as I'm aware there are no Lindis specific studies and not even really Otago specific studies, there are only national assessments. The impression I had from those without having extracted data is that the head of the Lindis might expect slightly more water but that the, as we go further east we do expect somewhere there to be a transition to less rain and higher temperatures. So while there might be more water in the river there will also possibly be a higher demand, evaporative demands to the east.

[262] We received evidence on this issue from Ms S E Keith, a project advisor who is employed by the Wellington Regional Council and is a section 274 party to the section 293 application. She gave evidence on behalf of her family, who own property near Tarras (but outside the Lindis catchment). She attached to her supplementary evidence[310] a 2017 report called *The past, present and future climate of Central Otago – implications for the district*[311].

[263] Ms Keith said that the report by Bodeker Scientific pointed out the potential for climate change to modify the climate in the Lindis catchment. She summarised its key points as follows[312]:

> (a) extreme rainfall events are likely to increase in intensity due to more moisture being held in a warmer atmosphere
> (b) a considerable reduction in mountain snow-packs and resultant water storage and, in the worst case, there would be very little mountain snow cover remaining by the end of the century.
> (c) where snow remains, snow-melt will occur earlier, leading to a significant reduction in the volume of water from snow melt being available through the spring melt season.
> (d) precipitation that would previously have fallen as snow and been stored in the snow pack will instead fall as rain and contribute more immediately to river flows and lake levels.

[264] Dr Cowie has considerable experience in considering the likely effects of climate change on water resources in New Zealand[313]. He referred to current models

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309 Transcript (2018) p 156 lines 11-18.
310 S E Keith supplementary evidence [Environment Court document 29A].
311 *The past, present and future climate of Central Otago – implications for the district* (2017) Bodeker Scientific.
312 S E Keith evidence-in-chief at [51] [Environment Court document 29].
313 Section 87 Report [7].

of climate change published by the Ministry for the Environment and observed that while these provided regional projections they "did not allow any precise predictions to be made for the Lindis catchment apart from saying it will become wetter, and more subject to extreme events"[314]. Of interest is that he considered natural variability, including the apparent effects of the Interdecadal Pacific Oscillation to be more significant[315]. The IPO results in switches between wetter and drier conditions in the catchment. Dr Cowie also pointed out that predictions for the Lindis are confounded by its geography. As recorded earlier, it has a high rainfall area in its headwaters and a much drier and warmer catchment between Lindis Peak and the Clutha River Mata-Au confluence[316]. He was not cross-examined on any part of his assessment on the effects of climate change.

[265] Ms Keith noted[317] that surety of supply is critical to the high level of investment required to shift to spray irrigation. Citing the Aqualinc reports relied on by the LCG, she said pivot irrigation needs a reliability of supply of 95-99%, with anything below that carrying a significant risk. The *Galleries 550/1639* (FG) scenario produces a reliability of supply of 84% according to Dr Cowie[318]. Ms Keith said that based on the Aqualinc report 89% would be considered as "poor" reliability.

[266] Ms Keith considered that, taking climate change impacts into account (as required by Policy B1 of the NPSFM) and the higher risks to the reliability of supply of the FG scenario, the LCG proposal would lock the applicants into a high level of debt and high-risk dependency on the river without the opportunity for adaptive management. She considered this would not provide for a sustainable future for the farmers or the river and would not meet Objectives B1, B3, B4 or B5 of the NPSFM. She also emphasised the risk to farmers in relation to the infrastructure investment required, if the climate changes outlined above come to pass. Her view was that, given the low reliability of supply in terms of the Aqualinc report, if there is not enough water to be found to supply irrigation under a different rainfall and climatic regime, the river will end up "paying for" that deficit[319].- Giving further oral evidence she agreed[320] that the minimum flow would be required through the consents process and that the

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314 Section 87 Report [237]-[238].
315 Section 87 Report [496C].
316 Section 87F Report [102] Figure 8.
317 S E Keith evidence-in-chief [50] [Environment Court document 29].
318 B Cowie evidence-in-chief [46] Table [Environment Court document 46].
319 Transcript (2019) p 9 line 10.
320 Transcript (2019) p 19 lines 10-21.

minimum flow would have to be complied with by the irrigators, so that any deficit would be worn by the irrigators, not the river.

[267] In cross-examination[321] about the reliability and viability of the 550 l/s minimum flow Ms Keith said she was not saying there shouldn't be farming, but that overlaying a new irrigation system while maintaining the land use that existed before the imposition of the minimum flow was not a solution, simply another piece of technology to use the water more efficiently. Her view was that people should step back and look at how to manage their land under a minimum flow of 900 l/s rather than assuming that farming will just go on as it has for the last 100 years.

[268] The court asked Ms Keith[322] how the probable but unquantified risks /probabilities around the effects of climate change she raised could begin to be quantified, to give any weight to her advice to the farming community about the degree of risk they would be accepting. She said she could not understand the lack of acknowledgement or analysis of the Bodeker report by ORC given it is a Central Otago based report[323]. She had been told in personal communication with Mr Bodeker that 90% of what she called "forcing" of the climate over the next 30 years would be due to natural variability, with 10% a result of anthropogenic forcing, so that the climate of the next 30 years will not look like that of the last 30 years. Later in the century the proportion of anthropogenic forcing would increase. She repeated her thoughts that a farmer would want some sort of buffer to protect against climate change as they wouldn't know the timing or scale of the change. She agreed that 10% variability could be considered a margin of error.

[269] In a further exchange with the court[324], Ms Keith was questioned about the prediction that there is likely to be a noticeable change in about 2050, according to the International Panel on Climate Change, which is about when a 30-year consent would need to be renewed, and whether this would provide a period of time for the irrigators to make adjustments as climate changes become more evident. Over that period, they would have the opportunity to observe and start adapting to changes that are currently unpredictable, for example, in changes snow fall or summer air temperatures that might affect seasonal rainfall and flow reliability. The farmers have to respond now to the

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321 Transcript (2019) p 18 lines 29-33.
322 Transcript (2019) p 20 line 6.
323 Transcript (2019) p 21.
324 Transcript (2019) p 22 line 22.

requirement for a new regime but they will have time to formulate new proposals over the 30 years to respond to what might be by then a different and better understood precipitation regime.

[270] When the court suggested that there are a series of adjustments being made by the irrigators now, and it could be a stepwise affair, over time, Ms Keith acknowledged[325] that there would be more water in the river at low flows, that the LCG would have to abide by consent conditions that the Regional Council has a duty to enforce, and that like the rest of the world they will have to respond to future changes and make further adjustments as needed if there are changes in precipitation as a result of climate change. Ms Keith agreed this plan change would be a step change but her concern was the risk to irrigators under the *Galleries 550/1639* scenario – and that they may not have taken the opportunity to be forewarned and consider farm systems in the light of water as a scarce resource. While the *Galleries 550/1639* scenario may be more efficient she thought the LCG haven't really looked at whether the land use is appropriate given the status of the land and the water available.

[271] During the hearing the court observed[326] that the farming witnesses have set out in detail what adjustments they are intending to make, and neither the Regional Council or the Environment Court can second guess what might be appropriate on individual farms. The LCG submits it is necessary to set the parameters now but best to let the farmers work through, by sensible trial and error, the best mean of managing now and how they can manage in future. While they will make more adjustments and future farmers will need to do the same, would it not be best that they do that work themselves. Ms Keith reiterated her view that there had not been a satisfactory examination of what other financial benefits could be gained by adopting other land uses and opined that now was the time to do that, citing lifestyle block developments and cherry orchards as potentially better land uses. She reiterated that there is no buffer for future users and there could be a more dynamic solution. There was some further discussion around the merits or otherwise of subdivision of farmland to lifestyle blocks as these may lead to other effects on the river, such as increased nutrient contamination.

[272] Ms Hanan also wanted to see the use of climate change projection to ensure best practice abstraction and to future-proof the activity. She said having heard Ms

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325 Transcript (2019) p 24 line 10.

326 Transcript (2019) p 24 from line 31 on.

Keith's evidence she felt even more strongly that climate change should have been investigated by the ORC to inform the decision-making process for the plan change. Her view was that she felt it necessary that the minimum flow be conservative and supported the 900 l/s minimum flow as it gave a little more "fat" to enable some life to be supported in the river. We will refer to the expert evidence on this issue later on, but in brief it shows that during the life of the plan (and indeed of the resource consents in the WPs application) the adverse effects of climate change are likely to be less than the probable beneficial effect (increased flows) of the IPO.

[273] The information on climate change in Ms Keith's evidence was the most comprehensive (although not necessarily the most focused) put in front of us and assisted by giving us a perspective about potential effects in this region. As was evident from the exchange above, climate change may well be coming but its rate, timing and magnitude is not clear, except to say that it may contribute 10% to climate variability over the next 30 years. Based on the apparent increase in the frequency and severity of weather events observed in New Zealand and elsewhere in the last 5 years the reliability of that prediction may be questionable. Climate change may affect the rainfall characteristics of the Lindis catchment within that period and there may be other land uses that will be more suitable if such changes are significant.

[274] But at this point, the land that would be irrigated under the *Galleries 550/1639* scenario is owned primarily by farmers who raise sheep and cattle. They have an irrigation scenario they are prepared to support that will maintain their livelihoods and, according to the evidence provided in support of the scheme, considerably improve the overall status of the river. Generally speaking, they comprise a well-organised and coordinated farming business community. They do not appear to be unconscious of the risks of continuing to operate under their current faming systems as things stand. They will have to continue to evaluate their land use and business models as climate-change effects become noticeable and they are best left to make those changes as they identify new opportunities and necessities.

[275] We can be guided by what are considered to be (IPCC) realistic predictions at this point, in terms of climate change over the next 30 years, and we can, via review conditions on the WP consents application (if granted), ensure that there is sufficient opportunity to adapt as change occurs if necessary.

6. How effective are the options in achieving the ORP:W's objectives?

6.1 The relevant objectives

[276] We discussed the relevant objectives of the ORP:W in Chapter 3 of this decision. In Chapter 5 we made findings on the current and predicted future hydrological characteristics of the Lindis River as required by Policy 6.40. We now analyse the effectiveness of the 550 MF option compared with the alternatives. Moving from the most general protective objectives to the most specific (and noting the relevant subchapters in which we discuss their implementation), they require:

- (6.2) maintaining the life-supporting capacity of the Lindis River's ecosystems (Objective 6.3.1);
- (6.3) protecting natural character (Objective 5.3.3);
- (6.4) avoiding adverse effects on, maintaining or enhancing amenity values (Objective 5.3.4);
- (6.5) protecting the presence of trout (Objective 5.3.1);
- (6.6) protecting indigenous values

We continue with consideration of the development objective which is about:

- (6.7) providing for the needs of primary industry (Objective 5.3.6).

Finally, in:

- (6.8) we draw conclusions as to the relative effectiveness of the relevant competing scenarios.

6.2 Maintaining the life-supporting capacity of the Lindis River's ecosystems

[277] Objective 6.3.1 is to retain sufficient flow in the river to maintain the life-supporting capacity of its ecosystem(s) and its natural character. But reading the ORP:W as a whole there are three particularly relevant implementing provisions. First, Policy 6.4.3 (and the following policies) sets minimum flows for the purpose of restricting primary allocation takes of water. Second, while, as we have explained, there is no express link to Schedule 2D of the ORP:W, that Schedule is expressly

headed "Schedule of matters to be considered when setting minimum flows and allocation limits" and so it must be relevant. Further, we consider Policy 5.4.2 (quoted in Chapter 3) assists in identifying the important natural use values under the ORP:W. All the non-anthropomorphic values in that policy are included[327] in the parameters discussed next.

[278] The ecological experts[328] developed a table comparing the relative risks of five flow scenarios on eight ecological parameters for six reaches of the river, at flows greater than median flow > 2,400 l/s and at low flow of approximately MALF 1,500 l/s, rating each parameter on a scale of 1-10, with one denoting a high risk of adverse effects of the flow regime on the parameter, and 10 denoting a low risk of such an adverse effect. The parameters were:

- native fish passage;
- juvenile trout passage;
- native fish habitat;
- trout habitat;
- macroinvertebrate habitat;
- water temperature;
- periphyton;
- fish mortality risk from low flow magnitude and duration.

[279] We will not reproduce all of the tables in the JWS (Ecology) for the Middle and Ardgour reaches here since they do little to distinguish the scenarios. Compared with the status quo all the other scenarios give rankings of 7 to 10 (mostly 10). There is one exception – for periphyton –which is uniformly poor at low flows under all scenarios (including the *Naturalised Flow*).

[280] Although the longitudinal (maximum) and longitudinal (original) graphs in the hydrologists' JWS did not model a *Races 900/1200* scenario, the ecologists included such a 900/1200 scenario in their rankings both with Galleries and with the existing infrastructure (Races).

327 Gravel beds are part of macroinvertebrate habitat. The dry(ing) parts of the riverbed are considered later.

328 Listed in Chapter 2 of this decision.

[281] The ranking tables show that there was close agreement between the ecologists on the effects on many of the parameters, with the only (mild) disagreement being about the effects in the lower losing reach on:

- juvenile trout passage under the *Galleries 550/1364*, where rankings ranged from 3 to 5; and
- fish mortality risk from the low flow magnitude and duration under the *Galleries 550/1364* with rankings 4-5 and *Races 900/2255* with rankings 7-8.

[282] We attach the experts' table here (we have added for ease of understanding our standardised description of the scenarios from Table 5.2) as Table 6.1[329]. We note that six scenarios are presented in the table and only five of those columns are described under a – e in the top row. We have added a description for column 5(e) and relabelled column 6 as (f).

329 Joint Witness Statement – Ecology (Mainstem) - Appendix 1 *Effect of flow scenarios on Freshwater Ecology* (in part) from Ex 10.5.

Table 6.1: Ecologists' rating of the effect of different flow scenarios between Ardgour FR and the Clutha Mata Au confluence

Parameter		Appendix 1 – Effect of flow scenarios on Freshwater Ecology habitat maintenance, food production, fish passage, critical reach, temp, risk of mortality). Flow scenarios considered: a. Status quo (present state with no minimum flow or allocation limit (primary allocation pursuant to 6.4.2 and 6.4.2A = 3777 l/s)) b. Future Galleries scenario (550 l/s minimum flow + 1639 l/s primary allocation) c. Future Races [corrected] scenario (900 l/s and 3248 l/s primary allocation with 2255 l/s peak daily rate of take). d. Plan Change 5A [decisions] scenario (900 l/s minimum flow, 1200 l/s primary allocation, residual flows of 51% of MALF). [e. Races 900/1200 scenario] f. Existing Environment [Naturalised Flow] scenario (no abstraction except for stock/drinking water.						
	SCENARIOS	**(a) *Status Quo***	**(b) *Galleries 550/1639***	**(c) *Races 900/2255***	**(d) *Galleries 900/1200***	**(e) *Races 900/1200***	**(f) "Existing Environment"** [330]
Native fish	Median flow (and above) >2.4	1	10	10	10	10	10
passage	low flow (~MALF, ~1.5 cumecs)	1	5	8	8	8	10
Juvenile trout	Median flow (and above) >2.4	1	10	10	10	10	10
passage	Low flow (~MALF, ~1.5 cumecs)	1	MH=5, GC, JH, GR, IJ[331], DO=4, RG=3, MT, DJ, ND =3	8	8	8	10
Native fish	Median flow (and above) >2.4	2	10	10	10	10	10
habitat	low flow (~MALF, ~1.5 cumecs)	1	7	8	8	8	10
Trout	Median flow (and above) >2.4	2	9	6	9	7 or 8	10
habitat	low flow (~MALF, ~1.5 cumecs)	1	4	6	6	6	10
Macro invertebrates	Median flow (and above) >2.4	2	9	6	9	7 or 8	10
habitat	Low flow (~MALF, ~1.5 cumecs)	1	4	6	6	6	10
Water	Median flow (and above) >2.4	2	7*	6	8	6	10
temperature	Low flow (~MALF, ~1.5 cumecs)	1	4	6	6	6	8
Periphyton	Median flow (and above) >2.4	2	7*	7	8	7	10
	Low flow (~MALF, ~1.5 cumecs)	1	2	2	2	2	2
Fish mortality risk from low flow magnitude and duration	Low flow (~MALF, ~1.5 cumecs)	1	MT=4, DJ, ND, MH, IJ, GC, DO, JH, GR=5, RG=4	MT, DJ, ND, MH, IJ, GC, DO, JH, GR=8, RG=7	7/8	7/8	10

[283] Ms Baker-Galloway was concerned that the experts had not considered the duration of low flows in their assessment. She submitted that[332]:

> ... the level of assistance the JWS Ecology table comparing effects on specific instream parameters for different flows and reaches provides is limited due to the different assumptions, and the fact no expert seemed able to take into account the critical factor of the duration of low flows. For example:
>
> (a) Mr Hickey confirmed his ranking reflected a simple scale of effect of a flow not

330 This is the Naturalised Flow option.

331 Asterisks in this Table referred to a footnote: Dr Jowett noted that "this value reflects the effect of rostering on flows observed. Initially, flows (and therefore passage) will be similar to [Fish and Game] PC5A Galleries [*Galleries 900/1200*], but as flows recede, the flows/passage will be more similar to that provided by Future Races [*Races 900/2255*]" in the Joint Witness Statement – Ecology (Mainstem) [Exhibit 10.5].

332 Fish and Game submissions 2 April 2019 at [92] [Environment Court document 59].

taking into account duration or frequency. Mr Hickey's no. 10 equated to a[n] extremely low risk"[333].

(b) Dr Olsen equated "10" to no abstraction. His numbers were intended to refer to the "severity of the impact"[334]. However Dr Olsen also assumed that low flows were "infrequent events"[335] which is not what JWS Hydrology attachment 4 illustrates. Dr Olsen did not consider the impact of duration of time at low flows[336].

(c) Dr Ryder did not look at duration issues associated with flows[337].

[284] Ms Baker-Galloway's criticism is based on a misconception. She says the experts failed to take into account the duration of low flows of the scenarios when compared with the Naturalised Flow option (which has a MALF of 1,750 l/s). However, she ignores what the experts were doing which is to consider the effects of the scenarios at the specific flows identified in the second column of Table 6.1. That she and, for example, Dr Olsen, were at cross-purposes is shown by her statement (quoted above) that Dr Olsen "assumed" low flows were "infrequent events". She referred to a passage in the transcript as the basis for that submission but what the transcript actually records is this[338]:

> Ms Baker-Galloway: When you were doing that ranking exercise were you looking both at probability - of an occurrence and seriousness if that actually occurred or something else?
>
> Dr Olsen: The numbers refer to the severity of impact. The way that the probability of occurrence was included.
> Ms Baker Galloway: In your mind?
>
> Dr Olsen: In my mind was in the fact that for each of the values it was divided into median flows and above and then low flows. So obviously low flows are kind of by definition infrequent events but were part of the assessment and then the median flows were kind of the more general conditions that you expect to see. I mean by definition the median is exceeded 50% of the time so that's the way I approached it.
>
> Ms Baker-Galloway: Did you consider that the longer amount of time the river spent at a low flow the higher the risk of that adverse effect occurring, was that part of your evaluation or not?

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333 Transcript (2018) p 297 line 7 onwards.
334 Transcript (2018) p 337 line 20.
335 Transcript (2018) p 337 line 25.
336 Transcript (2018) p 337 line 33.
337 Transcript (2018) p 369 line 3.
338 Transcript (2018) p 337 lines 17-32.

> Dr Olsen: Not explicitly, no.
>
> (Emphasis added)

The emphasised words show that Dr Olsen had properly considered the probability of different flows occurring.

[285] For Fish and Game Dr Closs explained his JWS (Ecology) assessment in this way:

> ... from my perspective I was providing that assessment on the basis that those numbers represent the likelihood of severe adverse effects happening where [1] would be that the effect is effectively certain to happen, so there will be an adverse effect, and 10 would be that the likelihood of an adverse effect would be negligible and the figures in the middle would represent a moderate risk[339].

Answering a leading question from Ms Baker-Galloway he said that duration of low flows was "not effectively discussed"[340] at the conference but he did not explain the significance of low flow events compared with median flows to give that any context.

[286] Mr Gabrielsson confirmed the witnesses did not have access to the attachment 4 to the JWS Hydrology (showing low flow duration)[341]. Despite that he explained that his approach was:

> I was basing my scores on a risk of the probability of something occurring and the likely adverse effect that if it did occur what would the outcomes be, and so there was a combined score of probability and potential adverse effect[342].

[287] Although she never made it clear to the witnesses or to the court, it seems that Ms Baker-Galloway was trying to have the experts reassess their evaluation on the basis of the flows in the Naturalised Flow option, not the flows specifically identified by the experts. We find that the experts' approach appears to comply with Schedule 2D of the ORP:W. More specifically we find that the rankings took into account both the probability of the effect and the severity of the impact because while[343] the ranking

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339 Transcript (2018) p 475 line 3.
340 Transcript (2018) p 475 line 11.
341 Transcript (2018) p 502 line 3.
342 Transcript (2018) p 502 lines 9-12.
343 Transcript (2018) p 337 lines 20-21.

expressly ranks the severity only; the probability was given in the flow scenarios listed in the second column in Table 6.1.

Comparing the 550 MF Option with the Naturalised Flow option

[288] Professor Closs described[344] the naturalised flows (with a MALF of 1,750 l/s) as "... realising [the river's] maximum potential in terms of provision of ecosystem services". In answers to questions from the court, he said that if the percentage change in habitat compared with the Naturalised Flow was less than 20%, he said he would be "less concerned" but if there was 50% reduction in habitat he would be "very concerned", particularly if the flow was held at that period for a long time because the "minimum flow determines the maximum size of the community"[345].

[289] Ms Baker-Galloway emphasised the naturalised 7-day low flow[346] at the Ardgour FR, submitting[347] it shows that "... naturally, the lowest 7-day low flow on record was 827 l/s in 2006". She compared that flow with the flow of 550 l/s (for a run of 35 consecutive days in the 25th percentile year) under the 550 MF option. Putting that to some of the ecological experts she had Dr Olsen confirm that the 2005/6 flows, which would take the river to 550 l/s for 106 days of the irrigation season, would be a "...significant low flow event"[348]. Dr Jowett, a very experienced hydrological engineer and ecologist, commented[349]:

> Well in terms of hydrological alterations there's quite a high degree of hydrological alterations caused by these flow abstractions.

Dr Jowett described the river in his evidence-in-chief[350] as "... a low quality trout spawning stream" in fact, but acknowledged that if the objective was to protect the spawning of a nationally significant fishery, he would recommend setting it at 90% of habitat protection[351]. Dr Hayes (co-author with Dr Jowett of a relevant report) agreed[352].

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344 G P Closs evidence-in-chief [46] [Environment Court document 17].
345 Transcript (2018) p 491.
346 Joint Witness Statement - Hydrology Attachment 2 JWS Hydrology [Exhibit 8.2].
347 Fish and Game closing submissions [61] [Environment Court document 59].
348 Transcript (2018) p 336 line 19.
349 Transcript (2018) p 350 lines 6-7.
350 I G Jowett evidence-in-chief at [122] [Environment Court document 13].
351 Transcript p 355 lines 24-29.
352 Transcript p 380 lines 14-15.

In-stream habitat analysis

[290] In addition to all the brief summarising opinions in the ranking exercise, Dr Jowett produced his own comprehensive, reasoned and quantified analysis of the possible changes in habitat using a hydraulic habitat method[353]. Dr Jowett's conclusions as to the amount of habitat 'retained' (actually increased) by the *Races 900/1200* scenarios and the scenario(s) exemplifying the 550 MF options, compared with the Status Quo option, are shown in Table 6.2[354].

Table 6.2: Habitat retention (%) in the lower Lindis River for minimum flows of 550 and 900 l/s and 7-d MALFs relative to the status quo MALF of 259 l/s at the Ardgour FR

Species	Minimum flow (l/s)		7-day MALF (l/s)	
	Races 900/1200	Galleries 550	PC5A 932	Galleries 718
Habitat Retention (%)				
Flathead galaxias	116	106	117	111
Upland bully	112	110	112	113
Koaro	233	166	238	200
Common bully	108	109	108	109
Longfin eel <300 mm	158	135	159	148
Longfin eel >300 mm	251	198	254	231
Brown trout adult	536	291	559	407
Brown trout (<100 mm)	169	141	171	158
Food producing	379	240	389	309
Deleatidium (mayfly)	148	128	148	139

[291] Dr Jowett concluded[355]:

> Compared to the Status Quo, the 900 l/s minimum flow proposed under the PC5A [DV] [*Races 900/2255*] scenario will increase habitat by an average of 121% in the lower river [Table 6.2]. The 550 l/s minimum flow proposed under the Galleries [550] scenario will increase instream habitat in the lower Lindis River by an average of 62% [Table 6.2]. The largest increases are for adult brown trout and food producing habitat. ...If the adult trout and food producing habitats are excluded from the comparison, instream habitat at their respective minimum flows in the lower Lindis River will increase by an average of 62% for the PC5A [DV] scenario and by 37% for the Galleries scenario [Table 6.2]. Excluding adult trout and food producing habitats, the PC5A [DV] minimum flow of 900 l/s will provide an average of 25% more habitat than the Galleries[550] minimum flow of 550 l/s.

353 We will discuss this technique in more detail in our decision on LCG's application for water permits.

354 I G Jowett evidence-in-chief Table 3 [Environment Court document 13].

355 I G Jowett evidence-in-chief 118 [Environment Court document 13].

[292] Variation of fish and invertebrate habitat with flow showed as expected that at low flows the amount of instream habitat declined with flow[356]. The scenario with the higher flow at any point will provide the most habitat[357]. Dr Jowett added[358]:

> In some habitat-flow relationships (adult trout and koaro habitat, and food producing habitat), the decline was almost linear towards zero, but for species tolerant of low flows (upland bullies, flathead galaxias, common bully, *Deleatidium*, juvenile trout and juvenile eels) there was a more gradual decline until flows fell below about 200 l/s at the survey sites.

[293] Dr Jowett summarised those results as follows[359]:

- the *Races 900/2255* scenario (PC5A (DV)) gives more habitat in the lower 6 kms of the river;
- upstream 6 to 14 kms from the confluence the difference between the scenarios will "not be as great"; and
- for 14 to 24 kms upstream from the confluence the 550 MF option – as specified *Galleries 550/1639* will provide more habitat than the PC5A (DV) scenario *Races 900/2255*.

[294] An important part of the Fish and Game case is that the advantages of scenario *Galleries 550/1639* from 14-24 kilometres upstream could also be achieved by scenario *Galleries 900/1200*. This scenario was not considered[360] by Dr Jowett and there are difficulties with it as we discuss elsewhere.

[295] Dr Jowett[361] contrasted the amount of habitat available at MALF for the *Races 900/2255* and *Galleries 550/1364* scenarios relative to the naturalised flow MALF of 1,750 l/s in Table 6.3[362] (column headings modified for clarity).

[296] Dr Jowett summarised those results as follows[363]:

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356 I G Jowett evidence-in-chief Figures 3 and 4 [Environment Court document 13].
357 I G Jowett evidence-in-chief [110] [Environment Court document 13].
358 I G Jowett evidence-in-chief [111] [Environment Court document 13].
359 I G Jowett evidence-in-chief [119] [Environment Court document 13].
360 I G Jowett rebuttal evidence source [53].
361 Dr Jowett only compared FG, FR and status quo, evidence-in-chief [95]-[96] i.e. his "PC5A scenario" is with 3,248 l/s consented (2,255 l/s total take).
362 I G Jowett evidence-in-chief Table 4.
363 I G Jowett evidence-in-chief [121] [Environment Court document 13].

Compared to the naturalised MALF, the PC5A (DV) MALF [*Races 900/2255*] will decrease habitat in the lower Lindis River by an average of 16% (average of 84% retained Table 4). The Galleries [550] MALF will decrease instream habitat by an average of 23% (average of 77% retained). The largest decreases are for adult brown trout and food producing habitat. If these are excluded from the comparison, instream habitat in the lower Lindis River will decrease by an average of 15% with the Galleries MALF and by 10% with the PC5A MALF (Table 4).

Table 6.3: Habitat retention (%) in the lower Lindis River for minimum flows of 550 and 900 l/s and 7-d MALFs relative to the naturalised flow MALF of 1,750 l/s at the Ardgour Road Flow Monitoring site

Species	Minimum flow (l/s)		7-d MALF (l/s)	
	Races 900/1200 [PC5A (FR)]	Galleries 550	PC5A(FR) 932	Galleries 718
Habitat Retention (%)				
Flathead galaxias	89	82	89	85
Upland bully	111	108	110	111
Koaro	67	48	68	57
Common bully	113	114	113	114
Longfin eel <300 mm	88	76	89	83
Longfin eel >30 mm	84	66	85	77
Brown trout adult	51	28	53	39
Brown trout (100 mm)	80	66	80	74
Food producing	60	38	62	49
Deleatidium (mayfly)	86	74	86	81

[297] Dr Gabrielsson also used an hydraulic habitat model but only for trout. He modelled and considered *Galleries 900/1639* (which Dr Jowett did not). Based on Dr Gabrielsson's explanation Ms Baker-Galloway submitted that his assessment of habitat availability should be preferred. It showed[364] that for juvenile brown trout at 7-day MALF, only the minimum flow of 900 l/s gets anywhere close to 80% habitat retention (Professor Closs' safety zone) compared with the naturalised flow. A minimum flow of 550 l/s produced a range of 49-73% habitat retention depending on the curve chosen. These are outside the range Professor Closs considered "comfortable" compared with the naturalised flow.

[298] In terms of protecting the life-supporting capacity of the river we find that:

364 R M Gabrielsson Attachment RMG10 [Environment Court document 18].

- the 550 MF option is slightly more effective compared with the status quo option and 900 MF option in respect of the river as ecosystem for invertebrates and indigenous fish, but not for trout;
- the 550 MF option is slightly less effective than the 900 MF option and 15% less effective than the naturalised flow option as an ecosystem for trout[365].

6.3 Protecting the river's natural character

[299] Objective 5.3.3 of the ORP:W is to protect the natural character of the river. An important implementing policy directs that we must give priority[366] to avoiding – in preference to remedying or mitigating – adverse effects of the taking of water upon (relevantly):

- the natural values[367] of the Lindis River identified in Schedule 1A;
- the natural character[368] of the river; and
- amenity values[369].

[300] As we set out in Chapter 3, the natural values identified in Schedule 1A for the Lindis River are:

- gravel beds (of importance for resident biota);
- being weed free – aquatic "pest" plants are largely absent;
- a significant presence of eels;
- the presence of significant spawning areas for trout;
- the presence of significant development areas for juvenile trout;
- the significant presence of trout.

We will consider the anthropocentric values – the landscape dimensions of natural character of the river and the amenity values in this subchapter and in 6.4. We will then turn to the other natural values.

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365 I G Jowett evidence-in-chief [121] [Environment Court document 13]; R M Gabrielsson Attachment RMG 10 [Environment Court document 18].
366 Policy 5.4.2 ORP:W.
367 Policy 5.4.2(1)(a) ORP:W.
368 Policy 5.4.2(1)(e) ORP:W.
369 Policy 5.4.2(1)(f) ORP:W.

[301] Kāi Tahu values[370] will be discussed in chapter 8.

[302] Policy 5.4.2 ORP:W has a somewhat inconsistent approach to the protection of natural character of rivers and their margins. On the one hand there is a preference for avoiding adverse effects on the natural values identified in Schedule 1A[371] but on the other, all adverse effects on "the natural character" of the river and its margins are also to be avoided. Given the latter direction we now turn to the effects of the options on the more general aspects of natural character: landscape and visual amenity.

[303] We received two sets of expert evidence from landscape architects Dr Y Pfluger and Ms A Steven. They each assessed the effects of several flow scenarios on landscape, natural character and visual amenity. They reached agreement on the substantive matters and produced a joint witness statement. Their evidence was admitted without their attending the hearing.

[304] The landscape architects agreed that there are landscape values along the length of the river and it needs to be considered as a whole. They agreed braided rivers are a naturally rare ecosystem type nationally and internationally. Ms Steven placed high value on that, while Ms Pfluger considered the value to be lower, based on evidence about the degradation of the ecosystem and habitat values, particularly through weed invasion.

[305] Dr Pfluger considered the overall natural character of the river to be moderate-high along the Middle reach, apart from the nodes of modification where race infrastructure is located in/near the channel, and Ms Steven "moderate". Ms Steven[372] considered the lowest reach below the SH8 bridge is important in terms of landscape value as it is probably accessed most (from SH8). Dr Pfluger agreed the lowest reach is the most braided but pointed out that access to the Cluden Stream DOC reserve and access at other points near Ardgour Road is also available. She considered other areas equally important.

[306] The presence of braids in the river bed is dependent on the extent of vegetation and the flood flows which rearrange the floodplain. The degree of algal cover would be

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370 Policy 5.4.2(d) ORP:W.

371 Policy 5.4.2(1)(a) ORP:W.

372 Joint Witness Statement – Landscape [2] [Exhibit 34.1.c].

the same under any of the abstraction scenarios being considered. Flood flows regulate the extent of didymo and these would not be affected by any of the scenarios. They agreed that prolonged low flows have the effect of loss of connectivity due to drying of sections of the river and the perceptual misfit of the flow to the channel and substrate.

[307] The experts' findings on both visual amenity and natural character are comparable and their descriptions are similar. Ratings of natural character reflected detailed scoring for each reach and scenario. At a general level the differences between the experts were due to Ms Steven dividing the lower losing reach into two parts separated by the SH8 bridge while Dr Pfluger assessed the two reaches as one, bisected by the bridge. The assessments of the effect of didymo on natural character and the assessments of the quality of riparian habitats / wetlands also differed slightly.

[308] The "PC5A scenario" described[373] in Ms Pfluger's evidence is *Races 900/2255*. Ms Steven used "PC5A scenario" in the sense of *Galleries 900/1200*[374]. This may explain some of the mild differences in their conclusions about the effects of the PC5A scenario on natural character and amenity in their evidence.

[309] Comparing *Galleries 900/1200* with *Galleries 550/1364*, the former scenario would provide the highest flows through all reaches under all modelled flows. At higher flows modelled as 3,374 l/s and 2,468 l/s, the difference between the two scenarios would be negligible; at flows of 1,531 l/s or less the 900 MF option would provide higher flows than the 550 MF option and would provide for higher natural character.

[310] Comparing *Galleries 550/1364* with *Races 900/2255* the former scenario would provide for higher flows for all study reaches for 85% of the irrigation season. For the Crossing reach the *Races 900/2255 scenario*, which would provide for minor braiding, provides more flow than the *Galleries 550/1364*. The latter would have less adverse effect on natural character and amenity than the *Races 900/2255* scenario given that water is kept in the river for much longer. The *Galleries 550/1364* scenario would have the added benefit, from a landscape, natural character and amenity perspective, of removing the races and intake.

373 Y Pfluger evidence-in-chief [8(c)] [Environment Court document 23].
374 E A Steven evidence-in-chief [12(d)] [Environment Court document 24].

[311] We conclude that both the 550 MF and the 900 MF options would have lower adverse effects on natural character than the Status Quo option. Neither would be equal to the Naturalised Flow option, although the overall adverse effects on ecosystem capacity would be minor given the other existing modifications to the "natural" state of the main stem.

6.4 Avoiding adverse effects on, and maintaining and enhancing the amenity values of the lower Lindis River

[312] Preference is to be given to avoiding adverse effects on "amenity values supported by ..."[375] the Lindis River. A number of individuals who are section 274 parties to the water permits proceeding[376] presented evidence on the effects of water abstraction on (inter alia) the amenity values along the Lindis River. We consider[377] their general evidence here because it is relevant to PC5A.

[313] The provision of new hydrological modelling information and ecological considerations in the October 2018 joint witness statements of the experts - close to the start of this hearing - would have made it very difficult for those parties to understand the implications of the new information. For example, it was clear from an answer by Ms K G Hanan that she found (as have we) the documentation provided about the hydrology and ecology to be complex and confusing. She was not sure of the implications for the river of closing the major races and as a result[378] did not express a preference for closing them or keeping them open. We would not be surprised if the other lay witnesses felt the same. However, all these parties seemed to prefer *Races 900/1200* or in some cases *Galleries 900/1200* and we have read their statements in that light.

[314] Ms Keith, whose evidence on the effects of climate change we have already referred to, provided primary evidence in relation to the options for allocation and irrigation of water from the Lindis River. She described[379] her family's connection with the lower Lindis River and the enjoyment they have in their connection with it, now

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375 Policy 5.4.2(1)(b).

376 And some are section 274 parties to the section 293 application in this proceeding as recorded on the front page.

377 Under section 276(1)(a) RMA.

378 Transcript (2019) p 36 lines 13-18.

379 S E Keith supplementary evidence [Environment Court document 29A].

overshadowed by the change in hydrology. They have seen a near constant drying of the river bed in summer, with rotting vegetation, muddy puddles and proliferation of didymo and other weeds in the river bed, while in the surrounding environment there is a proliferation of pivot irrigators which themselves speak of the change in farming practices. Ms Keith considered[380] there is a change in the 'social contract' for farmers as peoples' perceptions change as to what is acceptable in terms of cumulative effects on the environment. In her opinion the setting of the minimum flow regime and of the primary allocation is the opportunity to carefully craft a regulatory framework that will enable a sustainable future for the community and environment. She recognised that the LCG has been doing their best to carry out that careful process over a long period and acknowledged this has created uncertainty and stress in relation to its members' future livelihoods.

[315] Ms Keith preferred[381] the decision scenario she referred to as "Scenario 5A". That scenario is described by Mr Hickey[382] as being:

> Based in the current level of taking water (3.248 m^3/s) from the Lindis River under existing intake and irrigation infrastructure, with water takes subject to a 0.900 m^3/s minimum flow at the Ardgour Road monitoring site.

That is our *Races 900/2255* scenario, but through Ms Keith's evidence it become clear her preference was for a minimum flow of 900 L/s and an actual 1200 L/s primary allocation (*Races 900/1200*). Summarising the benefits of this regime, she mentioned[383]:

- the connecting flow to the Clutha River of 450 l/s;
- improved fish habitat, improved recreational values and improved aquatic ecological conditions in the lower river;
- more water volume in the braided reach to maintain a sense of its natural character;
- improved habitat for bird life passing through the area;
- these attributes also provided at the gaining reach and upper losing reach with the 51% MALF level of protection.

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380 S E Keith evidence-in-chief [18] [Environment Court document 29].
381 S E Keith evidence-in-chief [24] [Environment Court document 29].
382 M A Hickey evidence-in-chief [14c] [Environment Court document 10].
383 S E Keith, evidence-in-chief, [25]-[29] [Environment Court document 29].

[316] While acknowledging the positive elements of *Galleries 550/1639*, which include being catchment-wide and encouraging locally-driven cooperative management, as well as removing the inefficient races, Ms Keith could not support it. Her reasons[384] were:

- the flows at the confluence with the Clutha would be 100 l/s in the driest and hottest parts of the year;
- "due respect would not be paid" to the full length of the river as a result;
- the recreational potential of the river to meet peoples' needs such as swimming and camping would not be met;
- Kāi Tahu's request that optimal habitat be provided and that mixing of waters take place would not be met.

[317] Ms Keith described *Races 900/2255* as not being a useful scenario for consideration[385], noting that other witnesses had been dismissive of the option; she also dismissed the Status Quo option as now being unacceptable socially, culturally, environmentally or "legislatively"; and noted that the "naturalised" scenario (Naturalised Flow option) was not sought by her, though it was useful for understanding the hydrology of the river, the impacts of abstraction location on the natural environment and provided a better baseline for comparison than the status quo.

[318] Ms Keith emphasised the risk to farmers in relation to the infrastructure investment required, if the possible climate changes outlined above come to pass. Her view was that, given the low reliability of supply in terms of the Aqualinc report, if there is not enough water to be found to supply irrigation under a different rainfall and climatic regime, the river will end up "paying for" that deficit[386]. In cross-examination she agreed[387] that the minimum flow would be required through the consents process and that the minimum flow would have to be complied with by the irrigators, so that any deficit would be worn by the irrigators, not the river. Further, in relation to the dry state of the river bed she had seen at the low flow of 300 l/s Ms Keith agreed[388] that under the scenarios for the [550 MF] option she would not see flows of 300 l/s, at Ardgour Road FR, provided the minimum flows are complied with.

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384 S E Keith evidence-in-chief [32] [Environment Court document 29].
385 S E Keith evidence-in-chief [33] [Environment Court document 29].
386 Transcript (2019) p 9 line 10.
387 Transcript (2019) p 19 line 10-21.
388 Transcript (2019) p 19 line 25-32.

[319] Asked about the videos (produced by Mr Hickey) that she had seen, she instead gave descriptions of her own experiences of the river over the last two summers. At no flow, in the summer of 2017-2018, when the flows at Ardgour Road FR were 300 l/s, she said the sight was devastating and tragic. This last summer (2018-2019) when the flows were 1,500 l/s at Ardgour Road FR, she described the river as substantial with stunning surroundings. Her view was that there is an opportunity with this Lindis River process to get the river quality and flows right[389], that 80% of New Zealanders who responded to a survey expressed concern about river water quality, and that the Lindis River could be a "poster child" for a successful allocation and management regime.

[320] Cross-examined about the reliability and viability of the 550 l/s minimum flow Ms Keith said she was not saying there should not be farming, but that overlaying a new irrigation system while maintaining the land use that existed before the imposition of the minimum flow was not a solution, simply another piece of technology to use the water more efficiently. Her view[390] was that people should step back and look at how to manage their land under a minimum flow of 900 l/s rather than assuming that farming will just go on as it has for the last 100 years.

[321] Ms K S Hanan, a teacher, with family property the near the Lindis River since 1986, described[391] the current character of the lower river, formed under the Status Quo scenario, saying that the natural character of the river has been increasingly degraded in recent years, including the frequent drying up of the lower reaches. She did not believe that *Galleries 550/1639* would address the problems of low/no flow in the lower reaches of the river. She described the loss of braiding in the lower river and the absence of swimming holes (providing photographs to illustrate these) which had previously been reliable for the family and other members of the public to use. The frequent drying left didymo and invasive weed species such as tree lupin and stone-crop, and the outcome was that the area was not safeguarded for recreation in accordance with the ORC's aims. Her view was generally in accordance with that of Ms Pfluger, who considered the visual amenity of the lower reach to be low, and Ms Steven, who considered the reach to have moderate natural character (the lowest value in her analysis of the river's reaches).

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389 Transcript (2019) p 13 line 19-24.

390 Transcript (2019) p 18 lines 33-34, p 19 lines 1-3.

391 K G Hanan evidence-in-chief [7] [Environment Court document 31].

[322] In relation to the surrounding landscape Ms Hanan was of the view[392] that irrigation of the farmland had changed both its visual character and its habitation values for local wildlife, saying that this was in conflict with the ORC's aim to protect the natural character of the area.

[323] Commenting on the closure of the Begg-Stacpoole race, Ms Hanan said[393] property owners affected by its closure may not have access to water from the Lindis in future – irrigators' rights are prioritised over others and some property owners would have their existing rights eroded. As noted later it appears the Hanans do not have any formal right to take water from the race.

[324] She considered that under the 550 MF option the condition and water quality in the lower reaches will be worse than the status quo some of the time. We predict that will likely be wrong: her view contradicts the evidence previously summarised on the hydrology and ecology of the river under *Galleries 550/1639*. The JWS (Ecology) indicates that all scenarios considered will provide an improvement over the status quo and that *Galleries 550/1364* will result in a continuous flow in the Lindis River to the Clutha confluence, albeit a smaller continuous flow than under the *Races 900/1200* option.

[325] Ms Hanan described a perceived "significant reduction"[394] in the number of birds she has observed on the Lindis River flats in recent years. She considered the effects of the proposed flows on bird life in the river have not been taken into account. We prefer the evidence of Dr Sanders and Mr van Klink, which was that the scenarios *Galleries 550/1639* and *Races 900/2255* will provide similar habitat during the river bird breeding season.

[326] Commenting on recreation and amenity value Ms Hanan said that restoring the maximum possible volume of water to the river is the best way to ensure it retains its natural character. She reiterated comments of Mr Ross Hanan about the use of the areas around the SH8 bridge by New Zealanders and overseas tourists who like to camp, swim and picnic. Her view was that the number of people using the area has declined due to the decreasing appeal of the area under status quo flows. Families with

392 K S Hanan evidence-in-chief [12] [Environment Court document 31].
393 K S Hanan evidence-in-chief [22] [Environment Court document 31].
394 K G Hanan evidence-in-chief [27] [Environment Court document 31].

children were often seen by the score in years gone by camping at the side of Ardgour road near the bridge. A free-flowing natural river would be a braided river which holds special appeal for families.

[327] In questioning Ms Hanan expanded on her description of the pleasure of being in the lower Lindis when flows in the river are relatively high in summer, saying that the summer just gone (2018/2019) was particularly good as flows ranged from 2,800 l/s to 5,000 l/s according to the Land Air Water Aotearoa record[395]. She remarked on the presence of swimming holes, the generally beautiful experience of being by the river and the pleasure also taken in it at these flows by families, campers, and people in motor homes. Her response to the videos showing flows in the lower reach of 550 l/s and 900 l/s was that both were depressing, and that she was disappointed to see that the minimum flow (900 l/s) she was fighting for was itself barely enough even though it was the best-case scenario out of those being considered.

[328] Ms Hanan criticised[396] Ms Dicey's analysis of the effects of the LCG proposal (being the application scenario *Galleries 550/1639*) as being designed around the needs of the irrigator and considered that the proposal creates two different rivers in terms of how flows in the upper reaches and lower reach are treated. She held concerns about the health of the river and its water quality and considered that the requirements of other users of the river besides irrigators have not been considered properly, this included other people, animals, insects, vegetation – and the whole ecosystem, not just trout.

[329] Summing up Ms Hanan said that the failure to protect the well-being of the lower river was a major flaw in the 550 MF option. She said that there should be a commitment to retaining a continuous flow to the Clutha confluence. The short answer is "there is": that is the point of setting the minimum flow at the Ardgour FR at 550 l/s.

[330] Mr T R Hanan, a researcher who has shared the family property near the Lindis River since 1986 supported[397] the PC5A (DV) scenario (*Races 900/1200*), which delivers 900 l/s to the Ardgour Road FR, although he considered this to be "barely a sufficient volume of water". He said the situation would be improved by the removal of

395 Transcript (2019) p 33 line 9.
396 K S Hanan evidence-in-chief [39]-[41] [Environment Court document 31].
397 T R Hanan evidence-in-chief [8] [Environment Court document 32].

the races and replacement with galleries. In his opinion[398] the LCG proposal *Galleries 550/1639* provides a significantly worse outcome for the lower catchment, providing 100 l/s at the confluence with the Clutha versus the 450 l/s under the *Races 900/1200* scenario.

[331] In his opinion[399] the Lindis River is unique as a braided river in the dry Central Otago region, deserving of protection and rejuvenation for its landscape and amenity values. The braiding of the river has decreased over the past 15-20 years and the area near the confluence has changed as well, with the willows that used to be present now gone as a result of floods. He described the history of the river, with multiple old braids evident on aerial photographs of the area. With a 900 l/s flow at Ardgour Road FR, he thought there would be a greater chance of sustained braiding occurring. However, we note Dr Olsen's expectation[400], accepted[401] by the hydrologists and ecologists that under natural flows the lower Lindis River would have a single main channel with some channel braiding. Further, as described earlier, fish ecologist Dr Ryder maintained that at lower flows a greater degree of braiding would split the flows and potentially impede fish passage[402].

[332] Mr Hanan said his family's use of the river under the Status Quo abstraction has been compromised by the loss of swimming opportunities over the last 10 to 15 years, with pools no longer forming where they used to, downstream of the bridge. Mostly swimming is now upstream of the SH8 bridge. He described that bridge crossing as a natural stopping point for tourists both national and international. People stop in the braided delta of the lower river, to swim, camp, picnic, watch birds, fish and collect wild food, simply run about or enjoy the shade of the willows. The area provides visual relief from farming activity. Mr Hanan considers[403] that the current treatment of the river from the Ardgour Road FR to the confluence is "not a good look for a clean green New Zealand image". His view was that a 900 l/s flow at the Ardgour Road FR will create a much-improved environment for recreation and hoped that the camping and picnic spots will again have the aesthetics and amenity value of a babbling river. He described the many exotic wildflowers along with the willows and poplars as being closely

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398 T R Hanan evidence-in-chief [9] [Environment Court document 32].

399 T R Hanan evidence-in-chief [13] [Environment Court document 32].

400 D A Olsen evidence-in-chief [60] [Environment Court document 12].

401 Joint Witness Statement 6 June 2018 at [3]. Appendix A of D A Olsen [Environment Court document 12].

402 G I Ryder rebuttal evidence [40] [Environment Court document 14A].

403 T R Hanan evidence-in-chief [24] [Environment Court document 32].

associated with the Central Otago landscape and commented on the range of bird species that use the river.

[333] Mr Hanan raised issues related to his family's use of a well for their household water supply, which after several years proved unreliable, and their use of a water take from the Begg-Stacpoole race[404]. Mr Hanan was concerned that the closure of the Begg-Stacpoole race and a 550 l/s minimum flow regime would provide less water at an equivalent point of the river than has been available in the past. The family relied on an historic agreement that they believed allowed their use of the Begg-Stacpoole race, which specified a minimum of 225 l/s to be kept in the race. In questioning by the Court Mr Hanan said he was not aware of any mining right or other right[405] that permitted the water take. Cross-examined he accepted there was no Council record of a water permit or mining privilege authorising the taking of water from the Begg-Stacpoole race[406]; neither did the record of title register any interest under section 417 of the RMA for the Begg-Stacpoole race[407]; and neither had the Hanan family obtained any right from Mr Perriam, on whose property the race was located, to use water from the race[408]. However, he said the Begg-Stacpoole race should be closed and that water should go back into the river. He thought the other races, the Tarras race for example, should be kept as they are with a 900 l/s minimum flow, unless the galleries proposal came in with a higher minimum flow rate at which point he would rethink his appraisal.

[334] In relation to water quality, Mr Hanan was concerned that a 550 l/s minimum flow would create more issues with cyanobacteria in the river and elevated levels of Nitrate. This was counter to the expert evidence of Dr Olsen, who said in cross-examination that there would be a greater volume of water passed through the river down to the Ardgour Road FR under all the scenarios relative to the Status Quo which would provide dilution in the lower river[409], noting however that other factors including interaction with the aquifer and changes induced by a switch to spray irrigation may also affect water quality. We note that the two galleries scenarios *Galleries 550/1639* would provide similar flows in the river at flows of approximately 1,531 l/s and above. We also accept Dr Olsen's view uncontested by any other expert – that there would be

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404 T R Hanan evidence-in-chief [30] [Environment Court document 32].
405 Transcript (2019) p 43 line 15.
406 Transcript (2019) p 45 line 11.
407 Transcript (2019) p 48 line 22.
408 Transcript (2019) p 50 line 6.
409 Transcript (2018) p 332 line 15.

little difference in the periphyton in the lower river under the 550 l/s and 900 l/s minimum flows.

[335] Mr Hanan considered that evaporation of river water in the lower reach would be high leading to the flow rates in the river being lower than forecast by the hydrologists such that there was a low likelihood of 100 l/s flows continuing to the confluence. He considered the *Races 900/1200* PC5A (DV) scenario provides greater certainty that water will flow to the confluence.

[336] The last of the Hanan family members to give evidence was Mr G Hanan. He too is a party to the direct referral. Since his evidence focused on the NPSFM we consider it in our discussion of that statutory document[410].

[337] Mr Sole, an archaeological consultant representing COES, said that the Society takes[411] the position that Otago's natural water resources need to be managed sustainably by ensuring their quality, quantity, natural characteristics and values are not only protected but restored as far as possible. He personally has visited the Lindis River for over 36 years either in transit or camping, walking or otherwise enjoying the Lindis River and surrounds with his family. He considered that the land use intensification with its visual and physical modification coincides with the longitudinal dewatering of the ecosystem and health and cultural values of the river.

[338] In his view a healthy river means a functioning braided river in the lower reaches, with runs, riffles and pools upstream, not dry stones and dewatered hollows. He preferred[412] the approach taken to assessment of the Lindis River in the "Cultural Impact Study Assessment of the Lindis River Flows"[413], rather than what he considered to be the compartmentalised approach adopted in the scientific evidence, with its confined technical approach and did not find the latter related meaningfully to the health and renewal of a functioning river.

[339] Mr Sole was concerned[414] that the water abstraction had degraded the upland tussock and inter-tussock species, moss, bog and woody shrubland ecosystems and

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410 Under section 276(1)(a) RMA in Chapter 8.

411 M Sole evidence-in-chief [21] [Environment Court document 39A].

412 M Sole evidence-in-chief [21] [Environment Court document 39A].

413 An annexure to the Section 87F Report [Environment Court document 46].

414 M Sole evidence-in-chief [24] [Environment Court document 39A].

their natural water collection and holding functions and wanted to see such land management reversed as it contributed to the decline in quality and availability of water inflows and recharges. There was no other evidence of that and we face the issue no further since most of the abstraction is from the main stem of the river and connected groundwater, not from "uplands". He was keen to see more monitoring and compliance to avoid ecosystem degradation and collapse. He disagreed with views stated in other evidence that the Lindis Crossing area is degraded and weed infested and opined (rather inconsistently) that it is capable of restoration if there is community input, flow continuity and uninterrupted connection.

[340] Mr Sole did not support the *Galleries 550/1639* scenario as it did not adequately provide for natural character, fish habitat and passage, wildlife or recreational use in the river between the Ardgour Road FR and the Clutha confluence. The COES preference was for the minimum flow of 900 l/s and 1,200 l/s primary allocation, to achieve those values. Even though this is less than the outcome originally sought by COES he considered it satisfactory, with residual flows on upstream takes and a guaranteed flow regime to ensure continuity.

[341] Ms B P Marsh is a retiree and trustee of the Tarras Community Trust. She has been an owner and resident of property near the Lindis River since 1995. In her primary evidence[415] Ms Marsh began by describing the pleasure she and her family have taken in their association with the Lindis River, and particularly the lower reach, over the past 30 years. With abundant swimming holes, long wide wading shallows and fast flowing riffles and pools it provided then with great enjoyment over the summer months in early years when there was ample flow. Things have changed: she produced photographs taken over the period that her family has enjoyed the river, including some from summer 2016-17 when the river was dry.

[342] Because of concern about the decline of flows in the Lindis River, which by 2004 was no longer reliably swimmable, Ms Marsh attended workshop meetings for the Tarras Community Plan 2007. There was considerable emphasis on the importance of water at these meetings. The intention, as she understood it, had been to extract water from the Clutha River, meaning that the Lindis River flows would be restored and the problem of overallocation solved. The Tarras Community Trust was formed in 2008. The purpose of the trust was to enable the formation of an irrigation scheme to extract

[415] B P Marsh evidence-in-chief [Environment Court document 39].

Clutha River water and the Trust's Deed made that clear. The company Tarras Water Limited was established in 2009. In 2013 it released its prospectus but was unsuccessful in reaching the targeted 70% share uptake and the venture was abandoned.

[343] Ms Marsh saw the failure to establish this irrigation scheme as a lost opportunity for the Lindis irrigators to future-proof their farming using a reliable water source. However, she said that the lack of a reliable or sustainable water source had not discouraged the Lindis farmers from investing in the installation of pivot irrigators. The pivot irrigators in the Ardgour valley were all installed after the failure of Tarras Water Limited in 2013[416]. This was an investment risk as the permits were known to expire in 2021 with no guarantee of renewal or replacement. She said irrigated land has expanded to areas previously unsuited to irrigation such as flat upper terraces and sloping land above the races, while previously only gravity fed water was all that was available. She produced aerial photographs[417] showing the increase of irrigated land in the Lindis catchment. Ms Marsh said this was the basis for her conclusion that irrigation has increased, with increasing effects on the river.

[344] Figure 3 of Ms Marsh's evidence also showed the water schemes in the Tarras – Lindis Bendigo area that are extracting water from the Clutha River. These include:

- (area A) Terrace Irrigations' dam at Ardgour Road/SH8 intersection;
- (area B1) Ardgour Station;
- (area B2) Tarras Farms at southern Ardgour Road/Thomson's Gorge Road;
- (area C) Lindis Crossing;
- (area D) Kotiti farms on the Ardgour Valley western terraces; and
- (area E) Rangitata Farms on the Bendigo Terraces.

[345] Ms Marsh remarked that while the LCG states it is not practical or too expensive to take water from other sources such as the Clutha River, the farms that are doing so have invested extensively in pivots and infrastructure along with ongoing maintenance and this has not hindered their ability to farm.

416 B P Marsh evidence-in-chief [27] [Environment Court document 39].
417 B P Marsh evidence-in-chief [29] and [32] figures 2 and 3 [Environment Court document 39].

[346] Cross-examined she provided further detail on the sources of water from the farms in areas A – E above, saying[418] that:

- area B1 was a 50/50 split of Clutha and Lindis water;
- B2 included 20% Lindis water;
- area C has some Lindis race water and some Lindis bore water; and
- area E used some Clutha and some Bendigo and Tarras aquifer water.

[347] Ms Marsh responded to comments in Mr Graham's rebuttal evidence[419] and clarified her statement that pivot irrigators installed post-2012 had been to blame for the depletion of the river, but acknowledged that the river had started drying in 2000, and has been a gradual decline since then. Ms Marsh considered that Mr Graham's rebuttal evidence clarified and supported her statements that Clutha River and other water was available to replace Lindis River water. Responding to Mr Graham's conclusion that the cost of now delivering a new supply to the Lindis to replace existing Lindis water would be enormous, even if it was to be shown to be technically feasible, Ms Marsh disagreed with Mr Graham that it was not feasible, as she is seeing water being pumped up into the Ardgour and the terraces above it, and to the back of the Bendigo, and to Jolly Road, so people are still developing on the basis there will be a return[420].

[348] New residents have come to Tarras in recent years. Ms Marsh described the community as having "experienced exceptional growth"[421]. In her view local residents have diverse backgrounds and occupations, to the extent that the "overwhelming majority of households" have incomes from occupations other than farming. She considers that most would prefer to see amenity values enhanced, rather than economic values. She said that the LCG's inclusion of the "Tarras community" as supporting the irrigators was wrong and misleading. In truth many within the community hold strongly opposing views.

[349] The economist called by the ORC, Mr Sanderson, questioned both the "exceptional growth" and the observation about the households relying on farming

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418 Transcript (2019) p 126 line 24.
419 D N Graham rebuttal evidence [18] [Environment Court document 23A].
420 Transcript (2019) p 127 line 28.
421 B P Marsh evidence-in-chief [37] [Environment Court document 39].

incomes. In his opinion the figures show the growth in resident numbers has been the same since 2001[422]. Mr Sanderson[423] also quoted statistics showing that 63% of the population of Tarras was otherwise employed and 37% are employed by the agricultural sector. In his opinion the majority of other employment exists but is not "overwhelming". As it happens Ms Marsh had carried out her own survey of the households (that is, permanent residents not including bach users) within the Tarras and Lindis area. She recorded and mapped[424] 178 households of which 116 (65%) had occupations that were not farming-related. The figures tally, so it depends what is meant by "overwhelming". We do not need to determine that here.

[350] In further (oral) evidence-in-chief, Ms Marsh stated that residents of Tarras had made considerable investment into property in the area, and that it is the amenity values that draw them there[425]. The increase in residents was due to the popularity of Wanaka, Cromwell and other parts of Central Otago and the growth was rapid. She felt that in the arguments in favour of the LCG scheme, the other farmers who do not draw water from the Lindis were being lumped together with the Lindis farmers as "the farming community". In her view some will not be affected by the plan change decision: from her survey, of the other 52 farmers in the area, 27 use water from sources other than the Lindis while 35 farmers (a fifth of the total number of residents) source water from the Lindis catchment. Neighbours and residents were being overlooked she felt. She was troubled[426] at the methods used by Dr Taylor when he was interviewing people about the LCG proposal, as he had interviewed only LCG members and a single Bed & Breakfast owner. She said his report did not reflect the views of the Tarras community because of its bias and was flawed as a result.

[351] In relation to flow losses to groundwater, in her evidence-in-chief[427] Ms Marsh remarked on the differing data on flow losses, which ranged from 440 l/s or 550 l/s in the 3 km reach below the Ardgour Road FR in a 2015 ORC Information sheet, to 450 l/s in the Section 87 Report of Dr Cowie. A difference of 110 l/s was concerning given the number of variables that contribute to determine groundwater loss, she said. We accept that but note that if the flow loss in the lowest reach is more than 440 l/s the

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422 K T Sanderson rebuttal evidence [41] [Environment Court document 25A].
423 K T Sanderson rebuttal evidence [42] [Environment Court document 25A].
424 B P Marsh evidence-in-chief [39] [Environment Court document 39].
425 Transcript (2019) p 124 from line 5.
426 Transcript (2019) p 125.
427 B P Marsh evidence-in-chief [49] [Environment Court document 39].

LCG would bear the risk.

[352] Ms Marsh was concerned that the ORC proposed a 750 l/s minimum flow at the PC5A hearing but now supports a 550 l/s minimum flow; she viewed the ORC's indecision as proof of the inaccuracy of science and lack of robustness in the process to set minimum flows. She did not understand how the LCG scenario can be supported with such a change from 900 l/s to 550 l/s, even allowing for the change from races to galleries, and said a flow of 100 l/s at the confluence would not provide for amenity, social values, or the natural character of lower losing reach.

[353] In conclusion Ms Marsh said she had believed that in 2021 the river would be returned to its natural flow and had looked forward to that. The economic values of a small group of users of the river have been allowed to take precedence over the amenity, natural cultural and ecological values of the Lindis River which have been degraded by abstraction over many years. She said that New Zealanders are striving to clean up our waterways, protect endangered species and protect our environment from the negative impacts of economic activities. The latter should not be allowed to negatively impact on the health of the Lindis River. In her view the minimum flow should be set at 900 l/s.

Conclusions

[354] We find:

- the scenarios with higher minimum flows and lower primary allocation (the 900/1200 scenarios with takes either through races or galleries) are very likely to have less effect on the Naturalised Flow environment than either the *Galleries 550/1639* scenario or the *Races 900/2255* scenario;
- the *Galleries 900/1200* scenario leaves the most water in the river at all flows modelled;
- the *Galleries 550/1639* scenario retains higher flows than the *Races 900/2255* scenario over the middle and upper reaches of the river, at all but the lowest of flows, but the latter leaves more water in the lower reaches at lower flows;
- in the Crossing reach below SH8 in dry years the *Races 900/1200* and *Races 900/2255* scenarios and the implausible *Galleries 900/1200* would

be as likely as not to keep 400 l/s at the Clutha/Mata Au confluence while the *Galleries 550/1639* scenario is likely to retain a considerably lower minimum flow (of 100 l/s);

- consequently in the most visible section of the river (the Crossing reach) the adverse effects of the 900 MF option will be less than the MF 550 option. To that extent the 900 MF option is more effective at achieving Objective 5.3.3 and Policy 5.4.2(1)(b) in that stretch of the river than *Galleries 900/1364*.

[355] Having found that, we add that one aspect of the potential adverse effects of the options on the amenity value of the river has been exaggerated: the effect of flows[428] on swimmability. We received some objective evidence about the relationship between water flows and river levels. Dr Jowett wrote[429]: "Water levels vary non-linearly with flow". He showed relationships derived from the instream habitat surveys of the upper and lower Lindis River in his evidence-in-chief[430].

[356] He estimated that the average water level difference between a flow of 900 l/s and a flow of 550 l/s is:

- 5 cm in the Lower reach (just above the SH8 bridge); and
- 5 cm in the Upper reach (Cluden Hill just below the Cluden Stream).

[357] By way of comparison at the natural MALF of 1750 l/s at the Ardgour Road flow monitoring site, water levels are only 8.3 cm higher than at a flow of 900 l/s. As Dr Jowett observed[431], the effect of flow on water level will depend upon the location of recreational areas, but in his opinion[432] "a reduction of 5 cm in the water level of a pool is unlikely to reduce the value of a pool for swimming significantly".

6.5 Protecting the presence of trout

[358] One of the natural values identified in Schedule 1A is the "presence of trout".

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428 We are considering quantity (volumes) here, not water quality. We remain concerned about the trend of water quality on the lower Lindis River.

429 I G Jowett rebuttal evidence [18] [Environment Court document 13A].

430 I G Jowett evidence-in-chief [106]-[107] [Environment Court document 13].

431 I G Jowett rebuttal evidence [18] [Environment Court document 13A].

432 I G Jowett rebuttal evidence [19] [Environment Court document 13A].

Adverse effects on trout are to be avoided in preference to[433] being remedied or mitigated.

[359] Mr C A Smith, the owner of and guide with a Wanaka fishing business, wrote evidence on behalf of the New Zealand Professional Fishing Guides Association ("NZPFGA") of which he is a member. Mr Smith never appeared to present his evidence and nor was it produced by another party. However, in case that was an oversight we briefly refer to his evidence[434] here (under section 276(1)(a) RMA).

[360] Mr Smith described[435] guided fishing as a small but important component of the tourism sector, based on sustainable rainbow and brown trout populations that reproduce through natural spawning and rearing. It relies on healthy and productive rivers, streams and lakes that provide good habitat for trout and other fish and wildlife. Guided fishing in Otago and South Island is increasing, although some anglers prefer to go alone. Outdoor recreation activities are expanding out into Central Otago from their traditional bases in Wanaka and Queenstown and this looks like becoming a major economic thread in Central Otago in addition to farming and horticulture.

[361] Guided anglers are worth[436] around $1200 / day in the Otago Region, including accommodation, food and guiding services and trout fishing is a major driver for tourists coming to New Zealand. Many stay for a week and fish for five days, such that the addition of another fishable river is a major drawcard to Otago, allowing people to stay and fish there rather than moving to other regions to fish. Mr Smith considered that the Lindis is not living up to its potential as a result of the flow decreases and drying up of the river in summer due to the water abstractions. While trout spawning and rearing do take place, disconnection of the river in summer and fish kills limit its potential as a natural hatchery.

[362] The NZPFGA submitted on PC5A (and is a section 274 party). It seeks a 1,000 l/s minimum flow and argues against a 750 l/s minimum flow saying the latter was inadequate for natural character, connection, fish passage, fish habitat and recreational fishing amenity. It considers the establishment of a 900 l/s minimum flow and 1,200 l/s

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433 Policy 5.4.2(1)(a) ORP:W.

434 C A Smith evidence-in-chief [10] [Environment Court document 47].

435 C A Smith evidence-in-chief [7] [Environment Court document 47].

436 C A Smith evidence-in-chief [Environment Court document 47].

primary allocation would "adequately, but not generously"[437] provides for the river. It would restore the Lindis River from its currently degraded state to one which would provide an appealing small fishery throughout its length in a picturesque setting. Spawning and rearing would also improve, contributing to the Lake Dunstan and Upper Clutha trout fisheries. It does not support the *Galleries 550/1639* scenario proposed by the LCG (or the *Races 900/2255* scenario).

[363] Mr R O Boyd is a recreational trout angler, fisheries biologist and scientist. He is also a Councillor on Otago Fish and Game Council and a trustee of Clutha Fisheries Trust. He gave evidence[438] on behalf of the Upper Clutha Angling Club of which he is a member and past President. The Angling Club has promoted the protection of the trout fisheries of the district over many decades and welcomed the setting of minimum flows. Active since at least the early 1930s, the club operated the former Lakes District Acclimatisation Society fish hatchery, liberating fish from the hatchery into the lakes, streams and rivers of the district. Members are mainly local residents interested in the recreational trout and salmon fisheries and in the well-being of the environment on which they depend.

[364] Mr Boyd said the current process for setting a minimum flow is a once in a lifetime, or once in a century[439], opportunity to rebalance the river away from a one-sided abstraction arrangement with no consideration of the environmental values of the river or its life forms or the needs of the wider community. Such a rebalancing needs to provide for a healthy aquatic ecosystem year-round over the full length of the river by setting a minimum flow that will achieve that. He accepted that natural conditions may from time to time mean the river dries up naturally, even if no abstraction is occurring. He wanted the flow to provide for the migration upstream and downstream, not only of trout but of eels, galaxiids and bullies, and for the benthic flora and invertebrates the fish depend on.

[365] With an appropriate minimum flow there will be a reliable and safe connection to the Clutha River for fish passage, and Mr Boyd considered that a minimum flow of 900 l/s will provide for that, protecting trout and other species from predation and from increases in temperature that may occur under climate change.

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437 C A Smith evidence-in-chief [20] [Environment Court document 47].

438 R O Boyd evidence-in-chief [Environment Court document 37].

439 This is obviously an exaggeration since the life of any water permit cannot exceed 35 years.

[366] Mr Boyd described[440] the historical effects of water abstraction for irrigation on Lindis River trout including considerable detail on the efforts made to salvage fish when the river bed dried out and/or the large races were closed during the late 1940s. This ranged from hundreds to upwards of ten thousand fish over periods of a few days between 1947 and 1950. The data indicated to Mr Boyd that juvenile and adult brown trout were abundant in the Lindis River, at least seasonally, and also indicated the potential losses of trout into unscreened takes and races that may have occurred. He considered it unacceptable that in the absence of regulation the irrigators have taken no steps to prevent or mitigate the effects on the flows or impacts on fish and other values.

[367] In terms of the Lindis River's value as a fishery, Mr Boyd said[441] it is not considered to be one of the better fishing rivers in the district. It does not hold many adult fish over the summer, the lower reaches are often dry and the river flats are heavily overgrown by willow limiting access. The best fishing is in the autumn when adult fish move into the river as temperatures fall, to spawn. He said a river with the attributes it has should support more adult trout throughout the year and be more productive for fishing. Those attributes include suitable substrates for spawning, abundance of benthic aquatic insect life on which trout feed, and a moderate gradient with a combination of pools, riffles and runs and generally good water quality. Mr Boyd considered[442] that excessive water abstraction has progressively compromised a healthy environment with consequential adverse effects on the trout population.

[368] In relation to abstraction via races or galleries, Mr Boyd's view[443] was that, whether a 550 l/s or 900 l/s minimum flow was adopted, any resource consents should be based on a scheme of sequential intakes to mitigate overall environmental impacts. He referred to Dr Jowett's evidence that *Galleries 550/1639* would produce about 50% more habitat at MALF than scenario *Races 900/2255*, and said the additional habitat gains for that part of the river are due solely to intakes located sequentially down the river. Best practice should be adopted in the methods used and locations of takes just as best practice should be adopted for use of the water on land.

[369] In Mr Boyd's opinion *Galleries 550/1639* would fail to adequately protect the

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440 R O Boyd evidence-in-chief [21]-[26] [Environment Court document 37].
441 R O Boyd evidence-in-chief [27] [Environment Court document 37].
442 R O Boyd evidence-in-chief [30] [Environment Court document 37].
443 R O Boyd evidence-in-chief [31] [Environment Court document 37].

natural or ecological values of the lower river and does not provide a fair balance between the interests and needs of the wider community and the commercial interests of the irrigators. He claimed it would leave the river bed dry and lose connection to the Clutha River for substantial periods. It would continue to place the values of the river second to the commercial values of a small number of irrigators. In his opinion flushing flows would not provide the safe and continuous flow that Mr Boyd said was necessary to enable fish to migrate to escape inhospitable conditions "at will" to avoid heat stress, lack of food, predation and other stresses. He said there was no certainty fish would be able to move right out of the river when flushing flows occurred. Cross-examined he agreed that flushing would provide value, though how much was uncertain, and when asked if he agreed with Professor Closs that it is better to try than not try flushing, he agreed[444].

[370] Compared to the Status Quo flow option Dr Jowett considered that both the *Galleries 550/1639* and *Races 900/2255* scenarios would be significantly better for benthic invertebrates and most fish species simply because they provide higher flows over much of the river. Trout will benefit most but native fish will also benefit from the riffle habitat where benthic invertebrates are most abundant.

[371] In the lower river, the *Races 900/2255* scenario at MALF provides marginally more habitat (an average of 6% more than the *Galleries 550/1639* scenario at MALF). At flows above MALF the *Galleries 550/1639* flows will be higher and will provide better invertebrate habitat and food production. The generally higher flows of *Galleries 550/1639* will tend to counter the effects of a lower MALF. In the upper reach the *Galleries 550/1639* scenario will provide about 50% more habitat at MALF than the *Races 900/2255* scenario. Overall the galleries scenario will probably support higher trout populations than the races scenario.

Effects on trout spawning and juvenile habitat

[372] Dr Jowett considered the only significant flow-dependent factors that may affect fish and benthic invertebrate habitat to be juvenile trout passage and predation. Juvenile trout are found in almost the entire length of the stream and in most tributaries. Adult trout migrate from the Clutha River in early winter and spawn in the mainstem and tributaries, with some remaining in the river until flows begin to fall in early summer

444 Transcript (2019) p 109 line 2.

when they move back downstream to the Clutha River. They often move during floods and freshes when flows are relatively high. Dr Jowett said he has observed many young trout in water depths of less than 0.1 m. Shallow water may increase predation unless the substrate provides sufficient cover to prevent it.

[373] Dr Jowett cited studies by himself and others in locations other than the Lindis River, that estimated survival of fry to be 2.7% to 4% in the first year of life. In their second year of life estimates for trout mortality were 87% and for the salmonid family more broadly, around 90%. Low flows may increase the risk of predation for juvenile trout but he considered that the proposed flushing flows will ameliorate this. Predation may reduce the number of young fish reaching the Clutha River but Dr Jowett considered this to be density-dependent to some degree, with high mortality when densities are high and lower mortality when densities are lower. He considered that predation in the lower reach of the Lindis River will have minimal effect on the population dynamics and fish stock of the Clutha River and Lake Dunstan.

[374] Compared with the Status Quo option, the increases in instream habitat at minimum flow for brown trout are, according to Dr Jowett[445]:

- 536% under *Races 900/2255*;
- 291% under *Galleries 550/1639*[446].

[375] For juvenile trout (<10 cm) the increases in instream habitat at minimum flow are, according to Dr Jowett[447]:

- 169% under *Races 900/2255*;
- 141% under *Galleries 550/1639*.

[376] We appreciate that Dr Gabrielsson had a different opinion. However we have to discount his opinions because his evidence is based on the discredited Rekker models. He does not compare the status quo with *Galleries 550/1639* in any detail as he focuses on *Races 900/1200*[448]. In any event, we find there are likely to be no

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445 I G Jowett evidence-in-chief Table 3 [Environment Court document 13]

446 Note Dr Jowett's FG in his Table 3 is *Galleries 550/1639*, rather than *Galleries 550/1364* in our Table 5.1.

447 I G Jowett evidence-in-chief Table 3 [Environment Court document 13].

448 Transcript (2018) p 520 line 16-33.

adverse effects on habitat when comparing these options with the status quo.

Fish passage and predation in the Crossing reach

[377] We read and heard considerable evidence on fish passage survival and predation at low flows (particularly below the SH8 bridge). Dr Ryder assessed the relationship between fish passage and flow in the Lindis River from the Clutha River / Mata Au confluence to a point approximately 1 km upstream of the Ardgour FR. This was a "critical riffle" analysis[449], using criteria for fish passage for key species and life stages agreed during expert conferencing. As part of that work he collected an extensive set of ground and aerial photographs on transects on several occasions between December 2016 and April 2017. He also updated his critical riffle analyses to account for revisions of the longitudinal model prepared by Ms Houlbrooke and Mr Henderson

[378] Dr Ryder described riffles as areas in the steam where water breaks over boulders, cobbles or gravel, resulting in shallow fast-moving water. "Critical" riffles may be particularly sensitive to changes in stream flow due to diminished water depth. Dr Ryder carried out the analysis in three reaches[450] of the river:

- the upper losing reach;
- the gaining reach from the Ardgour Road bridge to the Ardgour FR;
- the lower losing reach from the Ardgour FR to the Clutha River confluence.

[379] In these reaches eight "critical riffles" were selected, agreed and marked by a group of ecologists representing the freshwater expert ecology panel[451]. Dr Ryder surveyed water depths on transects across the riffles on five occasions between 24 February and 24 April 2017, following the shallowest part from one side of the river to the other. Flow rates were gauged by ORC hydrologists on each survey occasion, as close to the critical riffle transects as practicable.

[380] Dr Ryder used a (mathematically) simple formula to assess water depth along

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449 G I Ryder evidence-in-chief [12.1] [Environment Court document 14].

450 Described in more detail in Chapter 2.

451 M Dale (Te Runanga O Ngāi Tahu), Mr M Trotter (Otago Fish & Game Council), Mr M Hickey (Water Resource Management on behalf of LCG), Dr D Olsen, Mr M Neilson (Clutha Fisheries Trust), and Dr Ryder participated in a walkover and Dr Gabrielsson completed the expert panel. G I Ryder evidence-in-chief [18] [Environment Court document 14].

each transect along with critical depths for the life stages of the fish and determine contiguous widths of water that have suitable depths for passage. He carried out regression analysis and generated a "best fit" regression relationship between flow at the site and the amount of contiguous water deep enough to meet the fish passage criteria. He prepared similar relationships using the flow on the same day at the Ardgour FR (the control site for setting minimum flows in the Lindis River). He then presented plots showing relationships between fish passage and flow at two lower section riffles and summarised the estimated minimum flow[452] requirements for fish at each critical riffle based on the fish passage criteria.

[381] His conclusions were that[453]:

- sections of the lower reach below SH8 had no surface flow when the flow at Ardgour FR was below 390 l/s;
- a minimum flow of 900 l/s at the Ardgour FR was insufficient to meet the adult trout and salmon passage criterion at any of the eight riffles surveyed, and was insufficient to meet the yearling trout flow criterion at three riffles below the SH8 bridge and three riffles above the Ardgour Road bridge;
- in general *Galleries 550/1639* met the fish passage criteria more frequently than *Races 900/2255* in all three sections of the Lindis River below The Point;
- for the lower losing reach below the Ardgour FR his analysis showed that flows in the range 500-900 l/s at the Ardgour FR are insufficient to meet the fish passage criteria in the reach from SH8 to the Clutha / Mata-Au confluence, even for yearling trout with modest depth requirements for passage.

[382] *Dr* Hayes, *Dr Closs and Dr Gabrielsson disagreed, in their evidence-in-chief, with Dr* Ryder's use of the criteria despite previously agreeing to their use. They noted that the criteria were conservative and wrote that a smaller minimum depth of 5 cm may allow passage of young-of-year and juvenile fish. Dr Hayes said "the guidelines should not be construed as meaning that downstream passage by young-of-the-year and yearling trout won't occur when the passage depth and width criteria are not met by a

452 G I Ryder evidence-in-chief [28] and Tables 2 and 3 [Environment Court document 14].
453 G I Ryder evidence-in-chief [69]-[71] [Environment Court document 14].

modelled flow", and that a "proportion of motivated trout will be able to pass at lower flows than predicted by the modelling"[454]. Dr Gabrielsson[455] stated that he considered "the critical riffles in the lower and upper losing reaches to be short, which implies precautionary passage conditions should provide for twice the fishes' body depth. This equates to passage depths in the range of 5-10 cm for the size range of juvenile trout present in the Lindis over summer". Dr Closs stated, based on his own and Mr Trotter's research[456], "juvenile trout will pass downstream through riffles <5 cm deep, particularly at night."

[383] Despite *what* Dr Ryder called a "change in position"[457] from the agreement recorded in the JWS, he repeated his critical riffle analysis using 5 cm as the minimum depth and summarised his findings[458]:

- at flows of 575 l/s or more at the Ardgour FR with a minimum depth of 5 cm all the riffle cross-sections he had surveyed provided contiguous passage width greater than 1.8 m;
- if flows were reduced to 513 l/s two of the critical riffles did not have contiguous passage widths of 1 m or more;
- based on comments in Gabrielsson and Hay (2017) that the choice of 1 m contiguous width as a criterion is somewhat arbitrary, some passage would still be possible through each of the riffles at that flow.

[384] Dr Ryder did not agree with Dr Hayes' assertions that at 500 l/s there was a high risk of unsuccessful passage of young-of-the year trout at flows around 500 l/s, saying[459] that Dr Hayes did not elaborate on how he reached that conclusion, that it was contrary to the results of the critical riffle analysis and was unjustified. He said a comparison of fish passage at flows of 550 l/s and 900 l/s such as Dr Hayes' assessment risked over-simplifying the likely outcomes of the water management scenarios. He preferred the approach of comparing the longitudinal flow profiles for the various scenarios in conjunction with the flow duration information to gain a better indication of effects of the flow regimes on fish passage.

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454 J W Hayes evidence-in-chief [109] [Environment Court document 15].
455 R M Gabrielsson evidence-in-chief [49] [Environment Court document 18].
456 G P Closs evidence-in-chief [31] [Environment Court document 17].
457 G I Ryder rebuttal evidence [19] [Environment Court document 14A].
458 G I Ryder rebuttal evidence [23] and Table 3 [Environment Court document 14A].
459 G I Ryder rebuttal evidence [25]-[26] [Environment Court document 14A].

[385] Dr Ryder concurred with the rebuttal evidence of Ms Houlbrooke and Dr Olsen that the *Galleries 550/1639* scenario will result in flows that are equivalent or higher throughout the modelled reach (Ardgour Road to the Clutha confluence) than *Races 900/2255*) when flows at Lindis Peak FR are 1472 L/s or higher. Such flows will occur 88% of the time, and Dr Ryder concluded[460] that for 88% of the time fish passage will be better under the *Galleries 550/1639* scenario. For the remaining 12% of the time flows in the lowest 3.7 km will be less under that scenario, with rationing determining the flows in the rest of the lower Lindis.

[386] Questioned[461] about the relative merits of *Galleries 550/1639* and *Galleries 900/1200* Dr Ryder said he had not been asked to assess that scenario[462]. He was shown the longitudinal (maximum) model plots, all of which showed a flow under *Galleries 900/1200* greater than that for *Galleries 550/1639*. He said *Galleries 900/1200* may provide better fish passage, or the two scenarios may provide similar passage. That would depend on the magnitude of the differences between flows and on how the critical riffles behave at slightly higher flows than those he had assessed. He agreed that scenario would not be the worst case. He agreed to change his words in evidence "PC5A scenario" to Future Races (i.e. *Races 900/2255*) to avoid confusion between the scenarios as it was the latter he was referring to.

[387] In relation to the risk to adult fish migration at reduced flows Dr Ryder commented that adult trout migration typically starts in April, with adult trout moving into spawning tributaries immediately after a fresh. He agreed with Professor Closs' statement that such migration was "unlikely to be affected by abstraction for irrigation to any significant degree".

[388] Concerns about predation were raised by the Upper Clutha Angling Club in relation to the potential impact of 550 l/s minimum flows on juvenile trout migration and survival. Its witness Mr Boyd disagreed with Dr Jowett's conclusions that losses by predation will have minimal impacts on the population dynamics and adult trout stocks in Lake Dunstan and the Clutha River. He said[463] maintaining low flows of at least 50% of (naturalised) MALF was necessary to provide the minimum necessary to provide a healthy ecosystem and life-supporting capability that trout and other fish require. He

460 G I Ryder rebuttal evidence [33] [Environment Court document 14].
461 Transcript (2018) p 366 line 26 ff.
462 Transcript (2018) p 366 lines 27-30.
463 R O Boyd evidence-in-chief [42] [Environment Court documents 37].

expanded on this in questioning, saying that "we don't know exactly all of the rivers that contribute juveniles to the adult population in Lake Dunstan, but generally speaking, Lake Dunstan is an important fishery"[464]. The availability of juveniles to replace adults is reasonably important and there is a natural loss of juveniles through competition and population pressure. The Lindis River is one of the rivers that could provide a reliable supply of juveniles into that population and add resilience to the overall fishery. He also noted the potential for climate change to affect the smaller rivers because of increased temperatures and severe weather events, saying that we need to be considering the future, not just today, in terms of "where fisheries will go"[465].

[389] Mr Boyd said the Upper Clutha Angling Club seeks PC5A decisions version, i.e. the *Races 900/1200* scenario because it provides a continuous connection to the Clutha River that provides safe up and downstream fish passage for adult and juvenile trout and native fish species. It also seeks a requirement that best practice technology and management (including fish screening) be required as a condition of consent allowing abstraction of irrigation water from the river or aquifer. He added in cross-examination that he supported the closure of the existing races and substitution of galleries as this would improve the current situation[466].

[390] In cross-examination Mr Boyd was asked about his understanding of what the (*Galleries 550/1639*) scenario offered to the river, and he agreed there would be a significant decrease in primary allocation from 3200 l/s to 1600 l/s. He was not clear on whether this left more water in the river than the FR scenario (*Races 900/2255*) and said that, like others, he had difficulty in understanding the differences in the flows under the different scenarios[467].

6.6 Protecting indigenous values

[391] We use "native fish habitat" as a measure of the future standard of the natural value called "gravel beds"[468] since there was no precise assessment of the latter. As usual there are two sets of comparisons to be made. Comparing both *Galleries 550/1639* and *Races 900/2255* with the *Status Quo* in Table 6.1 shows that there is

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464 Transcript (2019) p 107 line 17, p 108 line 9.
465 Transcript (2019) p 111 from line 13.
466 Transcript (2019) p 108 line 20.
467 Transcript (2019) p 110 line 4.
468 In Schedule 1A ORP:W.

likely to be a large improvement on native fish habitat under either. On the other hand both scenarios are significantly poorer than the *Naturalised Flow scenario.*

[392] As for keeping the lower Lindis weed free, that is, as described earlier, largely a function of floods which will not be affected by either of the take options.

[393] The ecological experts did not rate the effects of the scenarios on eels, but it is included in part in two parameters in Table 6.1:

- native fish passage;
- native fish habitat.

[394] The *Galleries 550/1364* and *Races 900/2255* scenarios both fare poorly at low flows in relation to passage and habitat compared with the *Naturalised Flow* scenario. Both perform considerably better than the *Status Quo* as shown in Table 6.1. As between *Galleries 550/1364* and *Races 900/2255* the latter provides significantly better fish passage and habitat for native fish than the *Galleries 550/1364* at low flows in the lower reach of the river. In respect of eel habitat those conclusions are largely (and expressly) affirmed by Dr Jowett's study of habitat retention[469].

6.7 Providing for the needs of primary industry

[395] All the options other than the NF option provide water for farming on the evidence. There is little between the options for effectiveness in providing water except in relation to the (important) issue of reliability. We consider any other differences between them are more likely to be highlighted when we consider the efficiency of the options.

[396] The figures for reliability put forward for the LCG and ORC are[470]:

- under the *Status Quo* scenario there is 1,392 l/s of water with a surety of 94%, with 1,287 l/s in the main stem[471];

469 I G Jowett evidence-in-chief Table 3 [117] [Environment Court document 13].
470 S E Keith evidence-in-chief [50] [Environment Court document 29].
471 M Hickey evidence-in-chief [63(c)] [Environment Court document 10].

- with a minimum flow of 550 l/s there is 842 l/s of water with 94% surety (or better) in the catchment[472];
- a minimum flow of 900 l/s would only provide 492 l/s of 94% (or better) surety within the catchment[473].

[397] Those figures are important because water surety has a large impact on the infrastructure that can be deployed to use that water for irrigation. Using spray only intermittently is not effective (or efficient) because a crop supported by spray irrigation will quickly wilt and fail if spray is intermittent[474]. The utility of border dyke methods is that they can be used when water is intermittently available[475].

[398] Ms Keith[476] noted that surety of supply is critical to the high level of investment required to shift to spray irrigation. Citing the Aqualinc reports relied on by the LCG, she said pivot irrigation needs a reliability of supply of 95-99%, with anything below that carrying a significant risk. The *Galleries 500/1639* scenario produces a reliability of supply of 84% according to Dr Cowie[477]. Ms Keith said that in the Aqualinc report 89% would be considered as "poor" reliability. She paraphrased the summary of the LCG's consultant Mr G A Porter, as saying that "the 550 l/s minimum flow is a threshold at which the farms could be financially viable, and only if they do not carry debt or have less capacity to finish stock". This summary is slightly inaccurate. Mr Porter's evidence actually referred[478] to farms not being viable (even under 550 MF) if they already have "significant" debt (not "no debt").

[399] Ms Keith considered that, taking foreseeable climate change impacts into account and the higher risks to the reliability of supply of the *Galleries 550/1639* scenario, the LCG proposal would lock the applicants into a high level of debt and high-risk dependency on the river without the opportunity for adaptive management. She considered this would not provide for a sustainable future for the farmers or the river (and would not meet Objectives B1, B3, B4 or B5 of the NPSFM).

[400] We find that the *Galleries 550/1639* scenario is more likely than not to be more

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472 M Hickey evidence-in-chief [69(c)] [Environment Court document 10].
473 M Hickey evidence-in-chief [66(c)] [Environment Court document 10].
474 D Graham evidence-in-chief [19] [Environment Court document 23].
475 Transcript (2019) p 79.
476 S E Keith evidence-in-chief 50 [Environment Court document] 29].
477 B Cowie evidence-in-chief Table in [46] [Environment Court document 46].
478 G A Porter evidence-in-chief [100]-[101] [Environment Court document 24].

effective at implementing Objective 5.3.6 than *Races 900/2255* (although neither is as effective as the Status Quo option).

6.8 Conclusions on effectiveness

[401] In their JWS[479] the ecologists confirmed that at low flow, "the higher the flow the better the ecological outcomes when flows are below about median flow". All the longitudinal profiles and much of the data presented deal with flows below the median flow, which is 3,374 l/s at the Lindis Peak FR.

[402] Assessing the options against the Status Quo option, it is clear that in all flow regimes there will be more water in the Lindis River than while the mining privileges are being operated through the races, as currently. This means that under both the 550 MF and the 900 MF options (e.g. as exemplified by Mr Henderson[480]), there are few or no adverse effects on the Schedule 1A natural values compared with the Status Quo. Only the Naturalised Flow option is (much) more effective.

[403] We hold that both the extraction options are more effective than the Status Quo in achieving Policy 5.4.2. On the other hand the only option which actually avoids adverse effects on the identified natural values is the Naturalised Flow. The principal contest is between 550 MF and 900 MF options although neither of these avoid adverse effects on the natural values.

[404] In contrast the 550 MF option is more effective in achieving objective 5.3.6 (needs of industry).

7. The efficiency of the options

7.1 Aspects of efficiency

[405] Questions of efficiency are raised in various ways by the various statutory instruments. In the ORP:W Objective 6.34 is to maximise the opportunity for diverse consumption of water, so the general implicit policy is laissez faire, although of course this must be balanced against other objectives and policies. In particular Objective

479 Exhibit 10.5.

480 Mr Henderson's "Gallery" and "PC5A (900/1200)" scenarios respectively.

6.4.0A seeks to minimise the taking of water by taking into account local conditions and "the efficiency of the proposed water transport storage and application system". Objective B3 of the NPSFM seeks simply "to improve and maximise the efficient allocation and efficient use of water". It becomes necessary to look at Part 2 of the RMA. We should also have particular regard (section 7(b) RMA) to the efficient use of natural and physical resources.

[406] In *Marlborough Ridge Limited v Marlborough District Council*[481] the Environment Court – quoting from a paper by Dr A W Maughan – identified three standard components of efficiency – technical, allocative and dynamic. A *Guidance Document* to the NPSFM adopts those components in modified form by suggesting that efficient use may include (but is not limited to)[482]:

> - economic efficiency (also known as **allocative efficiency**); allocating water to enable optimum economic outcomes (eg allocating water to the uses which have the highest value to society and create headroom);
> - **technical efficiency**: maximising the proportion of water beneficially used in relation to that taken. It relates to the performance of a water-use system, including avoiding water wastage;
> - **dynamic efficiency**: adjusting the use of water over time to maintain or achieve allocative efficiency (eg enabling movement of allocated water and minimising the transactions costs for doing so).
>
> [Emphasis added]

[407] In relation to the first aspect of efficiency we are uneasy about the phrase "economic efficiency" since as the Environment Court pointed out in *Marlborough Ridge Limited* "All aspects of efficiency are 'economic' by definition"[483]. That is because economics is the study of all (scarce) resources. Further, using the description "allocative efficiency" is more informative because it emphasises that local authorities (and on appeal, the Environment Court) are making decisions about the allocation of resources.

[408] We will discuss efficiency issues under the emphasised headings but considering allocative efficiency last.

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481 *Marlborough Ridge Limited v Marlborough District Council* [1998] NZRMA 73 (EnvC) at 88.

482 *A Guide to the NPSFM 2014 (as amended 2017)* (2017) Ministry for the Environment, p 21.

483 *Marlborough Ridge* above n 481 at p 86.

7.2 Technical and dynamic efficiency

Technical efficiency

[409] For LCG Ms Dicey evaluated efficient allocation in terms of the viability of farms, and efficient use in terms of investment in efficient irrigation infrastructure. LCG's case is that technical efficiency will be achieved if the efficient Aqualinc volume is applied to consents[484]. This is apparently the standard approach in Otago to providing an efficient allocation: encourage technical efficiency and allow the consent holder to work out what to do with the water to make best use of it.

[410] As we understand Fish and Game's case it argues that that the *Galleries 900/1639* option would be a more efficient use of water because it allocates less water. That permits a higher minimum flow, therefore compelling the consent holders to use water more efficiently. We accept the submission from Mr Page that this reasoning is flawed because the higher minimum flow simply means that the water within the primary block is less reliable (because it is available to be taken less often). It is the reliability of the water that drives investment in highly efficient infrastructure, not the total primary allocation[485]. This is due to two factors – the relatively high cost of pivot irrigators[486], and the watering regime undertaken which requires a little water but often[487].

[411] The evidence of both Mr Hickey and Mr D N Graham (a pumping expert) for ORC/LCG shows the critical importance that the minimum flow has on water surety. Counsel submitted "Water surety in turn has a critical impact on the infrastructure that can be deployed to use that water for irrigation. That in turn has an impact on the technical efficiency with which that water is used". In summary, the higher the minimum flow, the less reliable the water is, and therefore the lower the portion of water that can be used for spray irrigation methods.

[412] The second part of Fish and Game's case on technical efficiency – supported by the evidence of Ms Keith[488] – is that the output per litre of water is ignored. These parties emphasised what they said was a lack of analysis of alternative uses and

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484 S Dicey evidence-in-chief [276] [Environment Court document 41].
485 LCG counsel closing submissions [139] [Environment Court document 62].
486 T J H Davis rebuttal evidence [17]-[23] [Environment Court document 33A].
487 T J H Davis rebuttal evidence [17]-[23] [Environment Court document 33A].
488 A section 274 party to the direct referral.

referred to the ORP:W's Objective 6.4.0A which requires account to be taken of the use[489] of the water. They claimed that other land uses might be more productive (growing cherries or grapes were examples mentioned) and that these might require proportionately less water. For Fish and Game, Ms Baker-Galloway submitted that technical efficiency is concerned with both input and output. In her submission, following the Aqualinc recommendation as to water input may not lead to improving or maximising technical efficiency in terms of output. This approach, in her submission, also fails to take into account the trends highlighted by Dr Taylor of the increasing diversification and 5% population increase attributed to viticulture, lifestyle blocks and "amenity migrants"[490], and "domestic visitors"[491] like Ms Keith's family and the Hanan family. She pointed out that Dr Taylor had agreed with Mr Sanderson[492] that:

> It can be expected that this trend of demand for more rural, residential and lifestyle properties will progress into the Lindis Valley in the future along with expected increase in areas of intensive horticulture.

[413] Ms Baker-Galloway later submitted that:

> ... technical and productive efficiency seems straightforward at first glance, in that they maximise output for the minimum input (in terms of resources or value). However, it is difficult to work out when an efficient point is reached. The NPS-FM uses the phrase "improve and maximise" but these are very different goals. Still, both will require some degree of reasonable threshold identified by the decision maker. It is submitted that any improvement of an inefficient practice does not automatically make it efficient and the maximum technical efficiency is not always achievable (for cost, climate or geographical reasons). In this instance, simply retiring the inefficient races, and installing high cost galleries, and high costs infrastructure for use of the water (centre pivots) for otherwise business as usual operations do not accord with the concept of maximising output, and minimising input.

[414] Beyond referring to the LCG/ORC witnesses, Fish and Game and Ms Keith provided little other evidence (beyond suggestions) to show that different uses of the water might be more efficient.

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489 Whether this policy is legal is an interesting issue – see *P & E Limited v Canterbury Regional Council* [2015] NZEnvC 106 at [26].

490 Transcript (2019) Dr Taylor, p 95.

491 Transcript (2019) Dr Taylor, p 96.

492 K T Sanderson evidence-in-chief [156] [Environment Court document 25].

[415] In fact the evidence[493] for the LCG from one of its members, Mr TJH Davis (of Longacre), is that shifting land use to high value crops such as cherries and grapes depended both upon access to capital (with borrowing costs) and upon reliability of water supply. LCG's economist, Mr Sanderson went further. He considered the potential of the land (proposed to be irrigated) for both horticulture[494] for urban and tourism uses[495]. He quantified these in his analysis of "total farm valued added"[496] but found they added less than LCG's proposed use of the water under the *Galleries 550/1639* scenario. We set out the figures in 7.3.

Dynamic efficiency

[416] Dynamic efficiency is concerned with relative increases in outputs over time. The LCG application for a suite of water permits itself represents an increase in efficiency over time with its move from races to galleries takes.

[417] Ms Keith said[497] the suitability of land use and the related timing of abstraction needed to be included in the analysis, noting that efficient allocation in the NPSFM includes technical and dynamic efficiency. In relation to efficiency, it was important to consider whether the greatest benefit is being delivered in return for the use of the resource, rather than simply looking at getting the highest productivity from the fewest inputs or resources, as she said Dr Cowie had done[498]. In her view dynamic efficiency implies the ability to be dynamic, that is, to be able to respond or adapt to change as necessary, depending on farm systems, changes in climate or market demand, for example. She considered the approach taken by Dr Cowie to be narrow, as his analysis was to balance a short-term focus with a long-term focus, improving efficiency over time. She said that a primary allocation limit that matches future maximum demand creates no opportunity or headroom for supplementary allocations for the period when minimum flow is reached, or for newcomers to the area to obtain access to the water resource, effectively limiting their economic opportunities.

[418] Mr Sanderson also considered the potential for land use changes to

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493 T J Davis rebuttal evidence [17]-[23] [Environment Court document 33A].
494 K T Sanderson evidence-in-chief [138]-[147] [Environment Court document 25].
495 K T Sanderson evidence-in-chief [188]-[157] [Environment Court document 25].
496 K T Sanderson evidence-in-chief [101]-[113] [Environment Court document 25].
497 S E Keith evidence-in-chief [37] [Environment Court document 29].
498 S E Keith evidence-in-chief [38] [Environment Court document 29].

horticulture[499] (vineyards, apricots and other stone fruit) or more intensive "lifestyle" subdivisions or resort development[500]. He expected the demand for land for all these activities to continue (or to increase)[501]. However, in his opinion they all (especially horticulture) demand reliable water[502]. Ms Keith wrote that Mr Sanderson and Mr Porter compared the economic viability of a 550 l/s minimum flow to the Status Quo with a minimum flow of 900 l/s. She saw the focus of their analysis as a missed opportunity, as the farm systems at the basis of the analysis do not reflect consideration of resource scarcity, resource use efficiency or the externalities of the systems. They considered a new irrigation design and technology overlaid on the existing farm systems to buffer them, rather than considering alternative land uses, despite their recognition of the suitability of the land for horticulture and the likelihood of increased demand for rural lifestyle living in the area. Lack of a more detailed analysis of such alternatives limited the full consideration of best land use for the Lindis environment being considered.

[419] Ms Keith said in her final submissions that "missing from the analysis is an examination of the dynamic nature of a farming system which has the ability to change …"[503]. In our view she has overlooked (at this time) the evidence of Mr Sanderson which spent some pages on the demand for land for other uses. His principal point, which we accept, is that most of those alternative uses also demand water. In his rebuttal evidence he also observed that there is only one (long established) vineyard in the Lindis despite much development elsewhere. In his opinion that suggests that they are not viable in this catchment[504]. Cherry orchards are also as yet unproven[505]. Several of the farmers who gave evidence made similar points. We consider that the LCG and ORC have sufficiently considered other uses of the land in the Lower River.

7.3 The allocative efficiency of the options

The tests for allocative efficiency

[420] The *Guidance Document*[506] to the NPSFM explains that efficient allocation may

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499 K T Sanderson evidence-in-chief [138]-[147] [Environment Court document 25].
500 K T Sanderson evidence-in-chief [148]-[157] [Environment Court document 25].
501 K T Sanderson evidence-in-chief [156] [Environment Court document 25].
502 K T Sanderson evidence-in-chief [144]-[146], [153], [157] [Environment Court document 25].
503 S E Keith submissions 3 July 2019 at [4] [Environment Court document 71].
504 K T Sanderson rebuttal evidence [25] [Environment Court document 25A].
505 K T Sanderson rebuttal evidence [25] [Environment Court document 25A].
506 The *Guidance Document* NPSFM.

involve:

- using the most appropriate combination of mechanisms available for the circumstances under the RMA to ensure processes for allocating water are efficient;
- ensuring scarce water can be allocated and transferred to the highest value uses (either economically or in terms of other values placed on the water) taking account of issues of fairness and equity;
- enabling the movement of allocated water between users to improve outcomes and allow new water users to have an opportunity to gain an allocation, while also providing certainty of allocation over time;
- identifying any potential 'headroom' in a catchment once freshwater objectives are met, and providing this information to resource users in a way which enables efficient and equitable access to the available water;
- taking into account environmental, economic, social and cultural interests, and how these may change over time; and
- ensuring the rights and responsibilities of the recipient are clearly defined when allocating water.

[421] Mr Sanderson said that economic (allocative) efficiency is usually defined by referring to the definition[507] by Italian sociologist Vilfredo Pareto. This definition is that[508]:

> A state of affairs is *Pareto-efficient* if and only if there is no alternative state that would make some people better off without making anyone worse off.

Mr Sanderson continued: "This is generally interpreted in economics to mean that if the total earnings of the community is increased it is possible for some of the earnings of those who received an increase to be transferred to those whose earnings may have been reduced and to thus have both better off"[509]. That is slightly confusing because it describes what is called "Kaldor-Hicks efficiency" (named after two other economists). The latter is usually regarded[510] as the basis for economic (cost benefit) analysis which seems to be confirmed by Mr Sanderson's next paragraph[511]:

> For the purpose of this stage in the discussion I shall take the assumption that the amount

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507 M D Adler, "Cost-Benefit Analysis" in Encyclopaedia of Law & Society: American and Global Perspectives (2007) Sage Publications Inc DOI: http://dx.doi.org/10.4135/9781412952637.n136

508 M D Adler, "Cost-Benefit Analysis" above n 507.

509 K T Sanderson rebuttal evidence [15] [Environment Court document 25A].

510 M D Adler, "Cost-Benefit Analysis" above n 507.

511 K T Sanderson rebuttal evidence [15] [Environment Court document 25A].

> of benefit generated by a community from its resources, including its water, is measured by the GDP. That being the case then the economic efficiency shall be improved if total GDP of the community is increased. Later in this rebuttal evidence I consider alternative measures of impacts and wellbeing.

[422] She submitted that the Pareto efficiency criterion cannot be applied "meaningfully"[512]. In her view the allocation of water between in and out of stream uses in the Lindis catchment is[513]:

> so heavily weighted towards out of stream uses, and because the current users are so sensitive to changes in reliability of supply, nearly any change in allocation towards instream uses will result in a cost to one or more current users. Therefore, the Pareto efficient allocation of water uses in the catchment can only be the current allocation, or a [volume] very close to that number. This is directly at odds with other policy direction within the NPS-FM, such as safeguarding life supporting capacity or phasing out over-allocation.

[423] Ms Baker-Galloway submitted that, given the policy context and definitions within the NPSFM, it seems more rational to apply the "Kaldor Hicks criterion" concept of economic efficiency, as it comprises all inclusions listed in the NPSFM for allocative and dynamic efficiency components. However, she submitted that to do so meaningfully, more information is required about the benefits and costs of instream uses at different allocations and in particular on the externalities of the water takes.

[424] The *Encyclopaedia of Law and Society*[514] defines:

> A project [is] Kaldor-Hicks efficient, relative to the status quo, if the "winners" (those whose well-being is improved) could hypothetically compensate the "losers", leaving at least some better off and no one worse off.

It continues:

> Here, by contrast with Pareto efficiency, there has been much controversy. This focuses on the hypothetical nature of the Kaldor-Hicks criterion: it is not obvious why a choice that makes some persons worse off is normatively attractive merely because these individuals, hypothetically, could be compensated for their losses.

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512 Fish and Game closing submissions [139] [Environment Court document 59].
513 Fish and Game closing submissions [139] [Environment Court document 59].
514 M D Adler "Cost Benefit Analysis" above n 507 at p 2.

[425] We do not need to delve into those distinctions or problems because our obligation to consider the costs and benefits of the proposed options is clear under section 32 RMA.

The evidence for LCG and ORC

[426] The LCG and ORC called Mr K T Sanderson, a very experienced economist from Business Economic Research Limited whose evidence came in by consent. His assessment provided an overview of farms' land use and water use in the Lindis catchment, and view of the Tarras and Lindis valley community as it relates to the land and water use. He drew[515] on the evidence of Mr G Porter and Mr T Davis to describe the current farm situation and impacts of the three allocation and minimum flow options at the farm level.

[427] The total area in pastoral production in the Lindis catchment is recorded as 88,000 hectares. This supports 25 farms[516]. Mr Sanderson split those farms into two main groups, being high-country stations and the seven relatively intensive farms, and then split each into further groups. Of the high-country stations: nine stations irrigate using Lindis water, three stations irrigate using (now) water from elsewhere, and six high-country stations are without irrigation. The seven intensive farms group naturally into two sub-groups: three intensive breeding farms and four intensive finishing farms.

[428] The areas of these five groups of farms, and their land use as dryland production and irrigated production, is shown in Table 7.1[517]:

[429] The average size of the 9 high-country stations being irrigated is about 9,980 hectares, of which 240 hectares or 6% is irrigated.

[430] Mr Sanderson's assessment extended the analyses to the economic, employment and indirect impacts in Lindis valley community level for each of the three options represented by the *Status Quo*, *Galleries 900/1639* and *Races 900/2255* respectively. He then:

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515 K T Sanderson, evidence-in-chief [20.2] [Environment Court document 25].

516 K T Sanderson evidence-in-chief [21] [Environment Court document 25]. His footnote reads: AgriBase database. Update to November 2016, downloaded 2018. This land includes that land which has been irrigated using Lindis River water. Some of this land is outside what is strictly the Lindis catchment, however the irrigated production is or has been assisted with Lindis water.

517 K T Sanderson evidence-in-chief Table 1.1 [Environment Court document 25].

- estimated[518] the related indirect, value chain impacts of the scenarios at the District and Regional level;
- compared the *Status Quo*, *Galleries 550/1639* and *Races 900/1200* scenarios, estimating the total value added at the farm level if there was no longer the opportunity for irrigation of the current farms using Lindis water. He described this as[519] an approximation of the annual production value added from the farms in the catchment if the Lindis River was either required to operate as at present but with no Lindis irrigation water, or was to now be allowed to revert over time towards its "natural state".

Table 7.1 Current land use in hectares across the 25 farms

		Current land use (ha)		
Land use	**Number**	**Dryland**	**Irrigated**	**Total**
Irrigated high-country stations – Lindis water	9	33,681	2,151	35,833
Irrigated high-country stations -- Other water	3	15,158	1,494	16,652
Non-irrigated high-country stations	6	33,328	0	33,328
Intensive breeding farms	3	753	559	1,313
Intensive finishing farms	4	251	742	992
Total	**25**	**83,172**	**4,947**	**88,119**

[431] Mr Sanderson also evaluated[520] the opportunity costs of having a minimum flow of 550 l/s with gallery takes rather than 900 l/s with the majority of the water taken from the catchment diverted into upstream races. To do this he provided estimates of the potential impacts if additional water is left in the Lindis River as a consequence of the *Races 900/1200* scenario rather than the 550 MF option.

[432] Mr Sanderson described[521] how he arrived at the gross farm income. He deduced the farm working expenses to arrive at an "Economic Farm Surplus". He then allows for the value of workers to the economy by removing their wages from the farm working expenses and adding them to the EFS (effectively the sum of the producers' and consumers' surpluses) he has called farm value added ("FVA"). The net social benefit and FVA are both methods of assessing the contribution of the various options

518 K T Sanderson, evidence-in-chief [20.4] [Environment Court document 25].
519 K T Sanderson, evidence-in-chief [20.5] [Environment Court document 25].
520 K T Sanderson, evidence-in-chief [20.6] [Environment Court document 25].
521 K T Sanderson evidence-in-chief [64]-[65] [Environment Court document 25].

before us to New Zealand's Gross Domestic Product ("GDP")[522]. Mr Sanderson's Total Farm Value Added analysis gave the results displayed in Table 7.2[523]:

Table 7.2 Total Farm Value Added, five groups of farms, for the Status Quo, Gallery (550 MF) and Decisions (900 MF) scenarios

The grouping of farms	*Status Quo*	*Galleries 550/1639* scenario	*Races 900/1200* scenario
Irrigated high-country stations – Lindis water	3.95	3.31	-1.31
Irrigated high-country stations – Other water	1.84	1.84	1.84
Non-irrigated high-country stations	1.67	1.67	1.67
Intensive breeding farms	0.36	0.42	0.15
Intensive finishing farms	0.63	0.74	0.32
Total	**8.45**	**7.97**	**2.67**

[433] Of the first two columns, he wrote:

> In the relatively dry season of 2014-15, with the changes to irrigated production under the Gallery scenario, the total FVA for irrigated high-country stations using Lindis water would fall by $0.6 million or 16% to $3.3 million and be unchanged for the non-Lindis irrigated stations, and the non-irrigated high-country stations. It will increase a little, about 15%, for intensive breeding farms, and will increase by $0.1 million or about 17% for intensive finishing farms. Overall, for the 25 farms the estimated total farm value added in 2014-15 conditions would reduce from the current Status Quo level of $85 million to a level of about $8.0 million with implementation of the Galleries scenario.

[434] In relation to the costs of the *Galleries 550/1639* scenario Mr Sanderson referred to its adverse effects upon landscape and amenity, and upon the trout fishery:

- as to the landscape benefits, he relied[524] on Dr Pfluger's evidence that there is little difference in the natural character of the river at flows of 550 l/s or 900 l/s;
- as to the economic contribution of the Lindis fishery (as angling experience) Mr Sanderson expected that any effect would occur in the wider Clutha fishery rather than in the Lindis itself[525]. There was

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522 K T Sanderson evidence-in-chief [64] [Environment Court document 25], rebuttal evidence [7]-[11] [Environment Court document 25A].

523 K T Sanderson evidence-in-chief Tables 1.3 and 1.6 [Environment Court document 25].

524 K T Sanderson evidence-in-chief [127] [Environment Court document 25]. We note this conflates landscape and natural character values but in the circumstances of this case nothing turns on that.

525 K T Sanderson evidence-in-chief [129] [Environment Court document 25].

insufficient detail[526] for him to qualify the value of the fishery for spawning and as a nursery.

If those costs could be quantified they would be subtracted from the *Galleries 550/1639* scenario or perhaps more properly added to the PC5A *Galleries 900* MF option as benefits[527], but for the reasons given (when discussing efficacy in Chapter 6) we consider his analysis was proportionate to the scale of financial effects.

[435] Ms Baker Galloway said that Mr Sanderson's economic analysis demonstrates that not all individual farms in the Lindis catchment will be better off under the *Galleries 550/1639* scenario[528]. Referring to his evidence she wrote[529] that "Irrigated high country stations using Lindis water will be worse off in terms of the farm value added per ha than the status quo, while intensive breeding and finishing farms will be better off". On its face that is correct but there are uncosted positive externalities which Mr Sanderson identified in his evidence[530]:

> ... the high country stations use the irrigated production of feed to provide a level of certainty that they are able to carry their breeding stock in most seasonal conditions, and have the feed and viability to be able to responsibly manage the healthy ecological state of their hill country and high country.

Mr Davis made a similar point in his evidence.

[436] However the main thrust of Ms Baker-Galloway's submissions on efficiency is that because none of the parties assessed the benefits of ecosystem goods and services, the court does not know what an efficient allocation may be to achieve maximum net benefit across all users. Because there is no assessment of this in the (economic) evidence provided by ORC and LCG, it is impossible to say whether the Kaldor-Hicks criterion is met. As stated we are reluctant to enter into a theoretical discussion as to the applicability of the Kaldor-Hicks criteria under the RMA. Our task is to apply section 32 RMA and then consider the outcome of the resultant evaluation as part of the ultimate weighing in the scales.

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526 K T Sanderson evidence-in-chief [130] [Environment Court document 25].

527 K T Sanderson evidence-in-chief [134] [Environment Court document 25] if we understand this correctly.

528 K T Sanderson evidence-in-chief, Table 1.2 [Environment Court document 25].

529 Fish and Game closing submissions [137].

530 K J Sanderson evidence-in-chief [29] [Environment Court document 25].

[437] In any event the evidence for LCG and the ORC did consider the externalities and we now turn to consider that.

7.4 The externalities caused by taking water for irrigation

[438] Section 32(1)(c) RMA states that the evaluation of benefits and costs only needs to "contain a level of detail that corresponds to the scale and significant of the ... effects" that are anticipated for the plan change. In *Bunnings Limited v Queenstown Lakes District Council*[531] ("*Bunnings*") (a resource consent decision) the court:

> ... emphasise[d] that the assessment of comparative costs and benefits does not have to be a rigorous exercise – the *Treasury Guide* [*to Social Cost Benefit Analysis*] almost endorses a back of the envelope approach[532] "if nothing else, it will give an indication of what is at stake ...". The point is that even an approximation can show that a proposed use of a resource may be inefficient on the known qualifications (without taking into account non-use valuation). A good example is *Federated Farmers of New Zealand Incorporated (Mackenzie Branch) v Mackenzie District Council*[533] ... where the use of water for irrigation from the Tekapo Canal was found to be a less efficient use of the water than letting the water go through the hydro dams to be used for the generation of renewable electricity and then used for irrigation downstream of the lowest (Waitaki) dam.

We agree with *Bunnings* but add a caution – while the analysis can be quite general it must be reasonably comprehensive. At least, if a set of benefits or costs is omitted, the evaluation should justify that carefully.

[439] However, there is a limit to how perfunctory the evaluation can be. Ms Baker-Galloway wrote[534] in her final submissions[535]:

> Adverse social, recreational, cultural, intrinsic, bequest, existence and amenity...[536] effects (or externalities) of water abstraction from the Lindis are difficult to measure and even more difficult to compare to financial measures. The relative importance or value of making a certain profit or safeguarding life-supporting capacity to a certain level will be different for different people. Perhaps because of this, the economic evidence presented

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531 *Bunnings Limited v Queenstown Lakes District Council* [2019] NZEnvC 59 at [182].

532 *Treasury Guide to Social Cost Benefit Analysis* (2015) p 6 at [4].

533 *Federated Farmers of New Zealand Incorporated (Mackenzie Branch) v Mackenzie District Council* [2017] NZEnvC 53 at [505]-[514].

534 Ms Keith made the same point.

535 Fish and Game submissions 3 July 2019 at [7] [Environment Court document 70].

536 A non-exhaustive list of externalities.

> by the ORC and LCG does not consider many of these externalities. Those that are considered, such as landscape[537] and fishery values, are quickly dismissed as too difficult or unnecessary. Economic and social evidence provided by ORC and LCG is heavily focused on the impacts of minimum flows and primary allocation to the current agricultural production system[538]. This does not assist the court in carrying out the allocative efficiency analysis as described in section 7.3 of *Bunnings* because it is not representative of the full set of outcomes from the activity.

In relation to her first sentence we observe that, in the absence of relevant matters of national importance under section 6 RMA (which are different because they must be recognised and provided for) it is not appropriate to raise vague allegations of intrinsic, bequest or existence values, without more. The legal truism that '(s)he who asserts must prove' is apposite in this situation. We now turn to consider the various potential externalities.

Effects on natural character

[440] We accept of course that the protection of the natural character of the Lindis River and its margins from inappropriate development is a matter of national importance[539]. Consequently, it is of some concern that the effects of the options on its natural character have not been quantified. However, for most of the lower river the 550 MF option will make minimal difference to the river or its (willow-lined) margins compared with the 900 MF option or the NF option as the relatively objective evidence of the two landscape architects demonstrated. We have carefully considered the evidence about the options in respect of the Crossing reach. We accept Mr Sanderson's reliance on the landscape expert that there is little between the scenarios and therefore no significant cost (financial) or otherwise which he should have taken into account.

Costs to the fishery

[441] Mr Smith, the fishing guide from Wanaka, said that "trout fishing is a major driver when booking a holiday in New Zealand and then deciding which location to stay and fish"[540], he pointed out that the average spend of tourists in the nearby Queenstown

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537 K T Sanderson evidence-in-chief [127] [Environment Court document 25].
538 This bias is further discussed at [124] of Otago Fish and Game's closing submissions.
539 Under section 6(a)RMA.
540 C A Smith evidence-in-chief [Environment Court document 46].

Lakes District was $529 per day and they stay an average of 2.5 days. It is possible that guided anglers spend more (a figure of $1,200 per day was mentioned) but as recorded in Chapter 1 the number of overseas anglers in Otago is small, and the number on the Lindis River is vanishingly small.

[442] In his rebuttal evidence Mr Sanderson also noted that none of the evidence for Fish and Game, the Upper Clutha Angling Club, or COES, gave any estimate of impacts on angling days by either locals or by overseas visitors. Finally, he recorded[541] that he had the methodology to make an assessment of the costs if such an impact had been identified. We conclude that the cost to anglers of the 550 MF regime compared with the Naturalised Flow is, on the evidence, minimal[542].

[443] All that corroborates Mr Sanderson's evidence-in-chief. There he fairly (and in accordance with principle) acknowledged that the additional water under the 900 MF option could be used to improve the Lindis River in its function as a trout spawning, nursing and angling location as a part of the wider Upper Clutha catchment fishery or to enhance the landscape values[543]. Mr Sanderson said there are economic assessment methodologies for estimating economic benefits from angling, but it is his understanding of the Lindis River that the other functions are more important than that of angling as such. Given the low number of angling visits[544] we consider that is a proportionate assessment. If the likely benefits/costs (in relation to a resource) of different options are likely to be low it is an appropriate response to omit them (if reasons are given) from a quantified evaluation.

[444] As for other uncosted ecosystem services the potential value of extra invertebrates and small native fish that would likely breed in the consistently larger flows of the naturalised flow option is likely to be substantially reduced (or for some native fish – eliminated) by predation from brown trout. Again we consider there is no reasonable case for saying these costs should have been quantified. We confirm that the issue has been dealt with at the appropriate level of detail[545].

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541 K T Sanderson rebuttal evidence [46] [Environment Court document 25A].
542 K T Sanderson rebuttal evidence [52] [Environment Court document 25A].
543 K T Sanderson, evidence-in-chief [20.6] [Environment Court document 25].
544 See [56]-[58] in Chapter 1.
545 Under section 32(1)(c) RMA.

Pollution from nitrogen and phosphorus emitted by farming activities

[445] There are concerns about the levels of (particularly) nitrogen ("N") in the Lindis catchment. These arise from a study carried out in the Lindis catchment in 2012-14 by the ORC which states that "... markedly higher N concentrations [were] observed at sites downstream of Archies Flat ... compared with those upstream, particularly during periods of low flow".

[446] The ORP:W sets a leaching limit for N of 30 kg/ha/year for the Lindis catchment and we note that the LCG's application for resource consent asserts that the principal land uses in the Lindis catchment (breeding and finishing farms) will meet that limit because nearby dairy farms[546] meet that limit and the Lindis uses (there are no dairy farms) will emit less N than the Hawea farms[547]. But merely because an activity is permitted does not mean it is costless to society.

[447] The LCG application for water permits states[548]:

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

[448] Mr Sanderson asserted, rather vaguely in his otherwise admirably detailed evidence, that there will be no negative environmental impacts.

[449] Ms R A Mudge, a "One Health" consultant with a "holistic approach to farm systems design, to improve overall performance, restore balance of ecosystems and profitability", for Fish and Game, asserted that the statement in LCG's application

546 In the Hawea Basin.
547 LCG application November 2017 pp 44 and 123 [Environment Court document 0.1].
548 LCG application November 2017 p 123 [Environment Court document 0.1].

(which is the only detailed information we have) is misleading because the finishing farm modelled from LCG by Mr Porter[549] has a higher stocking density than "some" dairy farms[550]. Ms Mudge then claimed that the finishing farm system is "... likely to lack the infrastructure, such as barns/feed pads to mitigate nutrient [e.g. N] losses ..."[551]. In her view N losses on the finishing farms are likely to be in the range of 50 to 100 k/N/ha/year[552].

[450] Mr G Porter, the farm advisor called by the LCG, considered that Ms Mudge's N loss range was "unsupported and a gross exaggeration"[553]. He relied[554] on an "Overseer"[555] report on Mr T Davis' station which shows that the N loss on the irrigated areas of Longacre in the 2017/2018 season were 30 kg/N/h/year and overall averaged out to 8 kg/N/h/year. In his view[556] those figures are likely to be "typical" of farms in the Lindis catchment.

[451] Mr Porter also makes the points that[557]:

(1) the *Galleries 550/1639* scenario "... does not seek to extend the irrigable area in the Lindis but will result in the retirement of some border dyke methods in favour of spray irrigation"; and

(2) border dyke irrigation is "... typically associated with a greater risk of nutrient transport to water".

[452] Ms Mudge later wrote in relation to breeding (rather than finishing) farms[558] "... the overall impact on soils and biological resources is higher due to an increase in the average stocking rate per hectare". That statement was made in response to Mr Davis' evidence[559] which compared irrigated areas and stocking rates on his station (Longacre) and the dryland neighbouring property "Dryland":

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549 G Porter evidence-in-chief [Environment Court document 24].

550 R A Mudge evidence-in-chief [28] [Environment Court document 26].

551 R A Mudge evidence-in-chief [28] [Environment Court document 26].

552 R A Mudge evidence-in-chief [29(a)] [Environment Court document 26].

553 G Porter rebuttal evidence [17] [Environment Court document 24A].

554 G Porter rebuttal evidence [17] [Environment Court document 24A].

555 "Overseer" is a (frequently updated and amended) computer model for assessing changes to various chemicals at or immediately below the root zone of (usually) grass.

556 G Porter rebuttal evidence [5] [Environment Court document 24A].

557 G Porter rebuttal evidence [5] [Environment Court document 24A].

558 R A Mudge evidence-in-chief [60] [Environment Court document 26].

559 T J Davis evidence-in-chief [86] [Environment Court document 33].

Table 7.3 Irrigated areas and stock units on Longacre and Dryland stations

	"Dryland" station	Longacre Station
Effective area (ha)	3,521	3,304
Stock units (SU)	8,257	10,132

[453] Mr Sanderson stated that (for the same two stations as above), these numbers imply that the average stocking rate (stock units/hectare) would be 2.34 for the "Dryland" station and 3.06 for the Longacre Station[560]. He then wrote[561]:

> Ms Mudge indicated that because Longacre Station stocking rate per hectare was higher, the overall (negative) impacts on soils and biological resources are higher. This statement shows a basic misunderstanding of the factors which determine the carrying capacity or sustainable stocking rate of land. The sustainable, acceptable stocking rate on a property is determined initially by the complement of areas with given levels of Land Use Capability Classes (LUCs), and the expected climatic influences. The LUC Class 1 is the best land, LUC Class 7 is the harshest land and Class 8 should be retired for conservation.

[454] Mr Sanderson continued[562]:

> Observing the AgriBase data for SUs and the LUC data for the stations in the Lindis it is clear that a piece of land in the Lindis with 97% LUC Class 6 and Class 7 country could be overstocked with an average of 1 SU/ha. Another dryland high country station with 70% to 80% Class 6 & Class 7 country could be under-stocked with an average of 2 SU/ha. Whether a property is over-stocked or under-stocked becomes clear when the weather reduces the feed production and there is the inability or ability to flexibly handle that situation. This is dependent on the extent to which feed production is completely dependent upon the weather or not.

He then reiterated his primary evidence[563] (quoted above in subchapter 7.3).

[455] He was supported by Mr Porter who wrote that[564]:

> Lindis farmers are not wanting to expand and increase production through more irrigation, but they are willing to invest in a better, more reliable gallery intake system to hold onto what they already have in terms of irrigation. This is with the view to being able to maintain their current farming [practice] and levels of production to be sustainable long-term family

560 K T Sanderson rebuttal evidence [27] [Environment Court document 25A].
561 K T Sanderson rebuttal evidence [28] [Environment Court document 25A].
562 K T Sanderson rebuttal evidence [29] [Environment Court document 25A].
563 K T Sanderson evidence-in-chief [29] [Environment Court document 25].
564 G Porter rebuttal evidence [45] [Environment Court document 24A].

farming enterprises.

[456] None of these witnesses were cross-examined. We accept their evidence.

[457] However there is one area of doubt. We are uncertain as to what conclusions to draw about the pollution costs of the options. That is partly because – and on reflection we should have asked the witnesses about this – our current understanding is that the Overseer model referred to in estimating N levels is inaccurate. It is relatively reliable in indicating changes in rates from year to year, but much less so in giving accurate figures of N emissions.

[458] One tentative conclusion we can draw is that the 900 MF option is likely to emit more N (and P) than the 550 MF option because the former is less reliable and thus less spray-irrigation will be installed (or if installed, used). Thus pollution rates under the 900 MF option are likely to be higher because more border dyke irrigation will be retained. The net benefits differential between *Galleries 550/1364* and *Races 900/2255* would increase (to the latter's detriment) because the latter would have higher pollution costs.

7.5 Conclusions

[459] As we have stated the producers' and consumers' surplus from the various options were not assessed directly but a proxy for the net producers' benefits was evaluated by Mr Sanderson. He assessed the total farm value – "a direct contribution to GDP"[565] – added by the scenarios as shown below:

1.1 Status quo[566]	$8.45 million
2.2 Gallery 550 [567]	$7.97 million
0.1 Naturalised[568] Flow	$5.34 million
3.2 PC5A (DV)[569]	$2.67 million

[460] Mr Sanderson did not assess or deduct the galleries conversion costs from the

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565 K T Sanderson evidence-in-chief [76] [Environment Court document 25].
566 K T Sanderson evidence-in-chief Table 1.3 [Environment Court document 25].
567 K T Sanderson evidence-in-chief Table 1.3 [Environment Court document 25].
568 K T Sanderson evidence-in-chief Table 1.10 [Environment Court document 25].
569 K T Sanderson evidence-in-chief Table 1.4 [Environment Court document 25].

900 MF option if this moved from race takes to the more efficient galleries takes. These costs are not small – he elsewhere calculated[570] these at $45 to $40 per-irrigated hectare for the large high country farms and approximately $800 per irrigated hectare. But the net producers' benefits of *Galleries 900/1639* would be 2.67 million minus the capitalised conversion costs. We accept the evidence for LCG that this means the 900 MF option as *Galleries 900/1200* is simply impracticable: it would never be installed.

[461] Of the comparison of the Gallery scenario with the PC5A scenario Mr Sanderson wrote[571]:

> The total farm value added on the farms in the catchment was estimated above to be $8.0 million per year when operating under the Gallery [*Galleries 550/1639*] scenarios and the estimates for the five farm types in Table 1.6 show that this would decline to a total of $2.7 million per year under the PC5A Decisions Scenario [*Races 900/1200*]. This is a reduction by $5.3 million in the value added generated per year by the farms in the catchment under the Gallery Scenario [*Galleries 550/1639*]. This is the same reduction as the weighted average, which reduces by 66% or by two-thirds.

[462] We conclude that the 550 MF flow is likely to be considerably more efficient in its *Galleries 550/1639* form than either *Races 900/1200* or *Races 900/2255*. In fact, as Mr Sanderson observed, while the Naturalised Flow option would require all 25 farms using Lindis water to change all their systems to dryland production with effects on the owners' capital value, and a reduction in employment, this would still be preferable to the *Races 900/1200* which would require feed to be purchased and brought in to maintain production.

[463] For completeness we record that Mr Sanderson also made economic impact assessments (EIA) at both the district and regional levels. These generated impressive figures in favour of the 550 MF option. Ms Baker-Galloway criticised these – correctly in our view – on the grounds that they do not – unlike the cost benefit analysis take all the costs into account. Consequently we give no weight to this part of Mr Sanderson's analysis.

570 K T Sanderson evidence-in-chief [65] [Environment Court document 25].
571 K T Sanderson, evidence-in-chief [84] [Environment Court document 25].

Is the 900 MF option reasonably practicable?

[464] In our section 32 evaluation we are only obliged[572] to consider the "reasonably practicable options" for achieving the relevant objectives.

[465] The LCG and ORC submitted that on the basis of Mr Sanderson's comparative figures the 900 MF option (under any of the five 900 MF scenarios considered in our Table 5.1) is not reasonably practicable. We are inclined to agree, but since it was the cornerstone of Fish and Game's case we will continue to consider it in our evaluation.

[466] We should add that rationally, in the light of Mr Sanderson's figures, it would have made considerably more sense for Fish and Game to have pursued the NF option. That is confirmed by the evidence of its own expert on these issues, Ms Mudge.[573]. She appears to consider that the farmers in the Lindis catchment should adopt an "optimised dryland"[574] approach without (it appears) irrigation water. That corresponds to the NF option[575] which Fish and Game is not pursuing.

8 Summarizing the considerations to be weighed

8.1 Conclusions as to the ORP:W

[467] We found in Chapter 6 that neither the 550 MF option nor the 900 MF option is consistently better than the other in effectively implementing the ORP:W. We will take those conclusions into consideration when carrying out our ultimate weighing. That of course raises the question of what weight should be given to the objectives in respect of which we made our predictions.

[468] For Fish and Game, Ms Baker-Galloway submitted[576] that little weight should be given to the ORP:W for two reasons. First, because it is inconsistent with the NPSFM in relation to overallocation, and second because Policy 6.3.1 only seeks to maintain, rather than protect, the life-supporting capacity which is inconsistent with section 5(2)(b) RMA (and with the later objective B1 of the NPSFM). Given the multiple

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572 Section 32(1)(b)(i) RMA.

573 R A Mudge evidence-in-chief [2] [Environment Court document 26].

574 R A Mudge evidence-in-chief [35] [Environment Court document 26].

575 R A Mudge called this the "Existing Environment" scenario: evidence-in-chief [8(e)] [Environment Court document 26].

576 Fish and Game closing submissions [12] [Environment Court document 59].

layers at which the protection of life-supporting capacity needs to be considered, we consider that the ORP:W should not be too heavily discounted on the latter score. Of more concern is whether it should be given little weight because it does not give effect to the (later) NPSFM. We now turn to that statutory document and will then state our conclusions on the weight to be given to the ORP:W.

8.2 Giving effect to the NPS Freshwater Management

[469] We consider the competing options under the relevant objectives of the NPSFM in turn. We must give effect to these objectives, recognising that phrase "... is intended to constrain decision-makers" as Arnold J stated for the majority in *King Salmon*[577].

Consider and recognise Te Mana o te Wai in freshwater management (Objective AA1)

[470] For Fish and Game, Ms Baker-Galloway submitted that we should place some weight on Kāi Tahu values and referred to a cultural impact study[578] dated May 2017[579]. Mr G Hanan also considered that the estimated minimum flow of 100 l/s at the confluence does not provide for the Kāi Tahu values of the river[580]. He pointed to the naturalised mean annual low flow at the Clutha River confluence being about 1750 l/s; the proposed minimum flow of 100 l/s at the confluence is only 7.1% of that naturalised MALF. In his view[581] *Galleries 550/1639* provides "a trickle" that would not "enhance the mana of the whole river".

[471] For the ORC, Mr Logan pointed out that Kāi Tahu were a section 274 party to this appeal. In a memorandum dated 10 July 2018 counsel for Kāi Tahu concluded:

> Kāi Tahu wishes to advise the Court, the Appellant and other interested parties that it does not have an interest in the remaining aspects of the appeal. Kāi Tahu gives notice that it fully withdraws its interested party notice.

[472] Given that position and the fact that the cultural impact report was not tested, we hold that Fish and Game and other section 274 parties cannot place any reliance

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577 *King Salmon* above n 152 at [91].

578 *Cultural Impact Study: Assessment of Lindis River* (May 2017) Attachment 6 to the Section 87F Report [Environment Court document 46].

579 Fish and Game closing submissions [78]-[79] [Environment Court document 59].

580 G A Hanan evidence-in-chief [1] [Environment Court document 30].

581 G A Hanan evidence-in-chief [11] [Environment Court document 30].

on the reported Kāi Tahu values to support their positions. We also note from the Cultural Impact Report that the Kāi Tahu representative Mr D Higgins considered[582] that an "ideal width" of the Lindis River at the confluence would be 6 metres. The photographs produced tend to suggest that something less than that, perhaps 3 to 4 metres, is likely to be achieved at a 550 l/s flow at the Ardgour FR. That may not be ideal, but is a reasonable compromise between Kāi Tahu values and the needs of industry over the next three to four decades. The issue can then be reviewed.

Safeguard fresh waters' life-supporting capacity, ecosystem processes and indigenous species (Objective B1)

[473] We held in Chapter 4 of this decision that safeguarding the life-supporting capacity of water is linked to the life-supporting capacity of ecosystems, and that the scheme of the Act as particularized in the NPSFM shows that ecosystems containing indigenous biodiversity are relatively more important.

(Mainstem)

[474] Fish and Game approached the issue indirectly: counsel's submissions were headed "protection of significant habitats of indigenous fauna"[583] which appears to be a reference to section 6(c) RMA. As Mr Logan responded[584] there is no evidence of any significant habitat of indigenous fauna[585] in the main stem of the Lindis River (we consider the tributaries separately). In particular there is no evidence that the Crossing reach – on which we received considerable evidence – is a significant habitat for indigenous birds.

[475] However, Objective B1 of the NPSFM is both wider and looser than the section 6(c) test. It requires safeguarding (which we treat as synonymous with "protecting") the life-supporting capacity of the ecosystem of the main river. As we indicated earlier, life-supporting capacity is a flexible term and applies on a continuum. An ecosystem of threatened[586] species may require considerable research as to its pre-European

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582 *Cultural Impact Study: Assessment of Lindis River* (May 2017) at p 10 (Attachment 6 to the Section 87F Report) [Environment Court document 46].

583 Fish and Game closing submissions [74]-[77] [Environment Court document 59].

584 ORC closing submissions [295] [Environment Court document 61].

585 Within the meaning of section 6(c) of the RMA.

586 Under the New Zealand Threat Classification System; see the NZCTS Manual AJ Townsend et al DOC (2008).

condition and careful management in the future whereas the artificial ecosystem of all New Zealand's land mammals (except bats) may require much less protection in order to be safeguarded. Indeed, mustelids and possums are due to be extirpated by 2050[587].

[476] Mr G Hanan cited Dr Cowie's evidence that for 92% of the time the *Galleries 550/1639* scenario gives a better outcome in the lower reaches of the river, and then observed that the other 8% of the time will be during summer when the river is already stressed. Responding to the fact that the values of the Crossing reach of the river are low because of the effects of poor river cover and 4-wheel-drive tracks, Mr Hanan considered that a higher flow at those times would provide relief from such stresses. We doubt that a further 350 l/s would do much to reduce 4WD use of the Crossing reach in particular. In fact the lack of control over 4WD (and motorbike) access to and along New Zealand's braided rivers is a major ecological problem which should be addressed in any review of section 6(d) RMA.

[477] Mr Hanan is correct that more water in the braided reach would provide some relief for the ecosystem. Trout, the species of most concern to Fish and Game, is in a better situation under the 550 MF option compared with the Status Quo option (under which the presence of trout is already safeguarded) so the objective is met.

[478] If the Lindis mainstem was free of introduced predators (trout) then we consider the most important comparisons in this proceeding would be of the 550 MF and 900 MF options against the NF option because, where threatened indigenous fish species are present in (or could be returned to) an ecosystem, the natural conditions of that ecosystem are obviously important. However, the Lindis mainstem has trout present, so the importance of the ecosystem decreases under Objective B1 of the NPSFM (subject always to water quality standards) at least in relation to returning to natural flows. Where trout are present there is really no such set of conditions as a "natural state" to use as a baseline. There is only a condition of maximising trout size, population, and food production which have less importance under the NPSFM.

[479] In relation to braided river birds (for which the habitat is "very poor" anyway[588]), the 550 MF option is an improvement over the status quo but worse than the NF option.

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587 Predator Free 2050: see https://www.doc.govt.nz/predator-free-2050.

588 M D Sanders evidence-in-chief [26] [Environment Court document 27].

[480] As for eels, the experts agreed that[589]:

> ... as long as there is continuous surface water there is upstream passage for eels. Downstream passage of adult eels is driven by freshes and is not an issue in terms of low flow.

[481] They added:

> ... it was agreed that passage for yearling and/or adult trout would provide sufficient water depths for juvenile eels and other native fish species in the Lindis River.

(Tributaries)

[482] Turning to the tributaries of the Lindis River, many of them provide habitat for nationally threatened non-migratory galaxiid species. Consequently, that habitat is almost certainly significant under section 6(c) RMA. However, habitat for these indigenous species is not controlled by the minimum flow for the mainstem, but by residual flows and trout barriers in those tributaries[590] and that is more relevant to the water permits proceeding because there we have the power to impose suitable conditions to maintain or enhance the ecosystem of these species.

Avoiding overallocation (Objective B2)

[483] The 550 MF option reduces allocation and increases the volume of water instream. Mr Logan described this as "capturing the spirit of, if not the letter of, Objective B2"[591]. In respect of the first component of the definition of "over-allocation" in the NPSFM – "... the resource a) has been allocated to users beyond a limit ..." – we consider the issue is the other way around. Because the limit in the ORP:W is so high – 3,777 l/s or thereabouts – the river has in recent years run dry in a number of places (notably in the Crossing reach) for protracted periods as a result of abstraction for irrigation. On any reasonable layperson's understanding that is over-allocation of the water but it is not in terms of the definition.

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589 D A Olsen evidence-in-chief Appendix A, p 34 [Environment Court document 12].

590 D A Olsen evidence-in-chief [40] [Environment Court document 12]; I G Jowett, evidence-in-chief [162] [Environment Court document 13]; and D C Jack evidence-in-chief [34]-[37] [Environment Court document 42].

591 ORC closing submissions [123.2] [Environment Court document 61].

[484] As for the second component of the definition of "over-allocation", there was little evidence that any of the objectives of the NPSFM as to water quantity was not being achieved by the new scenarios under consideration. Consequently, this objective is largely not relevant here.

[485] The only issue where there is some doubt is in relation to safeguarding the mainstem ecosystem for native fish. We have held that any improvement in flow would improve habitat for indigenous fish and invertebrates compared with the status quo but improves habitat and food production (native fish and invertebrates) for trout even more. In these circumstances taking more water out of the stream is not overallocation under the NPSFM. In fact, there is some evidence[592] from Dr Jowett that low flows are relatively better for some native fish than for trout and that their populations recover more quickly. Dr Cowie had a similar view in respect of the two bully species in the mainstem.

Improving and maximising the efficient allocation and efficient use of water (Objective B3)

[486] We refer to the discussion of these issues in Chapter 7 of this decision as to efficient allocation and use of water. We found there that the most efficient allocation of the water is the 550 MF option. The allocation is maximised by the *Galleries 550/1639* scenario because it achieves the highest reliability of take (and therefore efficiency of use) compatible with improving the ecosystem services of the lower river through the whole of its length.

[487] As for maximising the efficient use of the water we can add to our discussion in Chapter 7 that Objective B3 must be read within Objective B5 (which is enabling communities to provide for economic wellbeing): we consider that in the circumstances the most efficient use of the water (once taken) can and should be left to the landowners and the market(s) they operate in because there is no evidence of "misuse" of the water. Opposing witnesses were critical of LCG's proposal that some border-dyke irrigation would be continued. In the longer term that could be reviewed under any resource consents (or on their "renewal") but in the short term we accept it is efficient as discussed in Chapter 7. Ultimately issues of maximising the efficient use of water (if legal) should be left to the WPs decision.

592 I G Jowett evidence-in-chief [21] and [74]-[76] [Environment Court document 13].

To protect the significant values of wetlands and outstanding freshwater bodies (Objective B4)

[488] Mr G Hanan considered[593] that the lower reaches of the Lindis were previously a braided river system and hence an area of interest. With higher flows its values could improve but he said this is not recognised by the LCG proposal (*Galleries 550/1639*). This evidence is incorrect because the Lindis River main stem in general, and the Lindis Crossing reach in particular, is not an "outstanding" fresh water body.

To enable communities to provide for their economic wellbeing (Objective B5)

[489] We have carefully considered the evidence of Ms Marsh and others but in the end we prefer the evidence of Mr Sanderson, Mr Porter, Dr Taylor and the farming witnesses on this issue. The more objective evidence is that the Tarras and Lindis River community is likely to be better enabled under the 550 MF option than the other options.

8.3 The ORPS

[490] The three relevant provisions of the ORPS in relation to minimum flows and life-supporting capacity/ecological values which we must give effect to are Objective 6.4.3, Objective 6.4.4 and Policy 6.5.4.

[491] Objective 6.4.3 mirrors section 5(2)(a) of the RMA. Implementing Policy 6.5.4 states that minimum flows should be set to protect habitats of indigenous fauna and flora, intrinsic values of ecosystems, and salmon or trout habitat. Fish and Game argued that because the experts agreed that more water in the river will lead to better values, *Races 900/1200* comes closer to achieving these parts of Policy 6.5.4 than *Galleries 550/*1639. We do not accept that assertion in relation to the habitats of indigenous fauna or for the intrinsic values of the Lindis River for reasons explained in Chapter 6. We accept *Races 900/1200* would provide better trout habitat in the mainstem of the Lindis River, but ultimately there is a conflict between protecting indigenous ecosystems (and their flora and fauna) and the artificial ecosystem which is the habitat of trout.

593 G A Hanan evidence-in-chief [6] [Environment Court document 30].

8.4 The partly operative PORPS

Safeguarding the life-supporting capacity of the ecosystem

[492] The first relevant provisions of the PORPS are Policy 3.1.1 and Policy 3.1.9. Policy 3.1.1 seeks to safeguard the life-supporting capacity of freshwater to maintain or enhance *inter alia* aquatic ecosystem health and, as far as practicable, natural functioning of rivers, their riparian margins and aquifers. While the experts agreed that more water in the river will lead to better values, the 550 MF and 900 MF scenarios cannot practicably achieve Policy 3.1.9 (ecosystems and indigenous biodiversity) of 100% pure natural functioning of the main stem because of the presence of trout.

Water allocation and use

[493] We consider the matters raised by Policy 3.1.3 of the PORPS are adequately addressed in Chapter 7. We find the policy is likely to be better achieved by the 550 MF option compared with the alternatives.

Landscape and natural character

[494] The PORPS and the ORP:W both contain provisions relating to landscape and natural character. The most complete framework is contained in the ORP:W, where Objectives 5.3.3 and 6.3.1, and Policies 5.4.2, 5.4.8 and 6.4.0 are relevant.

[495] The lower river's margins and surrounds are now highly modified and far from natural. The landscape experts agreed that the river moves from moderate/high down through moderate to having low natural character below the SH8 bridge. The landscape experts agreed that there is an added benefit in *Galleries 550/1639* from a landscape, natural character and amenity perspective, which arises from the removal of races and their intakes[594].

[496] Neither of the options actually open to us (550 MF and 900 MF) will produce a natural flow or restore a natural catchment. For example, there is no increase of the braids in river in the lower reach, between flows of 600 l/s and 900 l/s[595].

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594 Joint Witness Statement - Landscape [13] [Exhibit 8.2].

595 D A Olsen evidence-in-chief [17] [Environment Court document 12].

[497] In the opinion of the planner for Fish and Game, Ms F A Lojkine[596]:

> ... there is a tension between the requirements of policy 5.4.8(f) to have particular regard to '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' and the requirements of policy 5.4.2 (to give priority to avoiding adverse effects on the natural character of rivers) and objective 5.3.3 of the [ORP:W] and section 6(a) of the RMA (to protect natural character from inappropriate use and development).

We agree and will weigh these competing considerations (which we largely see as cancelling each other out) in our judgment.

Climate change

[498] Objective 4.2 of the PORPS is that "Otago's communities are prepared for and able to adapt to the effects of climate change". There are two implementing policies. The second, more general, policy is relevant[597]. It reads:

> **Policy 4.2.2 Climate change**
> Ensure Otago's people and communities are able to mitigate and adapt to the effects of climate change, over no less than 100 years, by all of the following:
> a) Taking into account the effects of climate change, including by using the best relevant climate change data;
> b) Applying a precautionary approach when assessing and managing the effects of climate change where there is scientific uncertainty and potentially significant or irreversible effects;
> c) Encouraging activities that assist to reduce or mitigate the effects of climate change;
> d) Encouraging system resilience.

[499] Section 7(i) of the RMA also requires us to have particular regard to the effects of climate change.

[500] We discussed the general evidence of Ms Keith on this issue earlier. In fact more focused evidence was provided by two LCG/ORC witnesses. First, Mr Henderson who gave hydrological evidence for the ORC declined to be drawn into making any predictions. He noted considerable uncertainty over the effects of climate change

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596 F A Lojkine evidence-in-chief [55] [Environment Court document 45].

597 The first relates to sea level rise.

during the proposed term of consents[598]. Second, Dr Cowie has considerable experience in considering the likely effects of climate change on water resources in New Zealand[599]. He referred to current models of climate change published by the Ministry for the Environment and observed that while these provided regional projections they "did not allow any precise predictions to be made for the Lindis Catchment apart from saying it will gradually become wetter, warmer and more subject to extreme events"[600]. Of interest is that he considered natural variability, including the apparent effects of the Interdecadal Pacific Oscillation ("IPO") to be more significant[601]. The IPO results in switches between wetter and drier conditions in the catchment. Dr Cowie also pointed out that predictions for the Lindis are confounded by its geography. As recorded earlier, it has a high rainfall area in its headwaters and a much drier and warmer catchment between Lindis Peak and the Clutha River Mata-Au confluence[602]. He was not cross-examined on any part of his assessment on the effects of climate change.

[501] We recognise that some of the potential effects of climate change could occur over a 35-year consent period and that the 900 l/s minimum flow provides some flexibility compared to the 550 l/s scenario where there is potential for there to be more days at low flow to exacerbate the adverse effects on the lower reaches. However, we consider that during the life of any proposed consents, the effects of climate change are likely to be swamped by the effects of the IPO. In any event these issues can be addressed by conditions upon resource consents. We are satisfied that Policy 4.2.2 is appropriately given effect to by the 550 MF option.

8.5 The Commissioners' Decision

[502] The Hearing Commissioners identified what they considered the minimum flow they had selected would achieve on the basis that this was defined following a long community consultation process and a notified plan and submission process. As Ms Lojkine observed[603] "[this] could, with a suitable dose of pragmatism, be considered the outcome that is sought for the Lindis River". However, she had[604]:

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598 Transcript (2018) pp 156-157.
599 B Cowie Section 87F Report [7] [Environment Court document 46].
600 B Cowie Section 87F Report [237]-[238] [Environment Court document 46].
601 B Cowie Section 87F Report [496C] [Environment Court document 46].
602 B Cowie Section 87F Report [102], figure 8 [Environment Court document 46].
603 F A Lojkine evidence-in-chief [43] [Environment Court document 45].
604 F A Lojkine evidence-in-chief [48] [Environment Court document 45].

> significant reservations in reaching this conclusion however, as in reality PC5A was not notified or considered in a way that gives effect to Policies CA1 and CA2 of the NPS-FM, and it is a long way from good practice to be retrofitting a freshwater objective to a proposal from the information available about what was considered by earlier decision-makers on that proposal.

[503] We consider the Commissioners' Decision is of little assistance for two reasons. First it is weakened by the various errors or misunderstandings identified by Dr Cowie[605]. Second and more importantly it relied on races abstraction whereas the LCG has now put forward the very different galleries proposal as one of the scenarios illustrating the benefits and costs (including ecological disbenefits) of the 550 MF option.

8.6 Part 2 of the RMA

[504] As to the necessity to consider Part 2 of the RMA there are inconsistencies in the ORP:W which suggest it might be desirable to do so. That is reinforced by our doubts that the ORP:W gives full effect to the NPSFM. Further, the truncated form of the NPSFM (objectives only) which is applicable to PC5A suggests that it too is incomplete. Consequently, we consider it is safer to check our preliminary findings in Chapters 5 to 7 against Part 2 of the RMA in addition to the matters already discussed in this chapter.

[505] The following matters need to be had particular regard to under section 7 RMA:

- the efficient use of the water[606];
- the maintenance and enhancement of amenity values and of the quality of the environment[607];
- the intrinsic values of ecosystems[608];
- the protection of the habitat of trout and salmon[609];
- the finite characteristics of the water resource[610]

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605 B Cowie Section 87F Report [32]-[33] and [172] [Environment Court document 46].
606 Section 7(b) RMA.
607 Section 7(c) and 7(f) RMA.
608 Section 7(d) RMA.
609 Section 7(h) RMA.
610 Section 7(g) RMA.

- the effects of climate change[611].

[506] We can have particular regard to most of these quite briefly.

(1) *Efficiency*

We have found in Chapter 7 that of the options open to us option 550 MF is the more efficient use of the water while retaining some reservations over the lack of quantification of the pollution externality (potential increased nitrogen and phosphate in downstream water). Chapter 7 may independently and with more objectivity confirm the result of our ultimate weighing exercise. At least it enables a cross-check against those conclusions.

(2) *Amenities and the quality of the environment*

It is important to note that section 7(c) and (f) require "maintenance and enhancement" of amenities and the environment, not "maintenance and restoration". In other words, these two paragraphs compare the predicted future with the (present) status quo not some pre-European or pre-human Eden. On that basis we have no difficulty finding that both the 550 MF and 900 MF options will improve the environment of the Lindis River generally and its amenities in particular, compared with the status quo option. Depending on operating conditions one scenario under the 900 MF option – *Galleries 900/1639* – would likely improve amenity along the whole river more than scenario *Galleries 550/1639*, but that matter is better addressed under a resource consent application.

(3) *The intrinsic values of ecosystems*

The values of the main stem ecosystem will be considerably increased in both the 550 MF and 900 MF options. It is common ground that keeping more water in the river for longer is more beneficial to the ecosystem compared to the status quo. In terms of the general health of the ecosystem we have no particular concern about low flows in dry years in the Crossing reach below the SH8 bridge. This is a short reach and some connectivity is to be retained at all times. As for the tributaries, PC5A does not change the status quo. Everything will depend on the conditions of future resource consents.

611 Section 7(i) RMA.

(4) *The finite volumes of water*

As for the finite volumes of water in the Lindis River and tributaries and the effects on them (and on the land in the catchment) we adopt our findings in Chapters 5 and 6.

(5) *Effects of climate change*

We have had particular regard to these in relation to the relevant policies of the PORPS.

The protection of the habitat of trout

[507] It is interesting that section 7(g) contains a normative element: it requires us to have particular regard to the "protection of the habitat" of salmonids whereas section 7(d) while apparently normative in referring to the "intrinsic values" of ecosystems actually refers via the section 2 definition of that phrase to the (complex) characteristics of an ecosystem. At first sight section 7(g) gives more protection to introduced salmonids than it does to indigenous fauna. It requires regard to be had to protection of all habitats of trout and salmon, whereas even section 6(c) only provides for protection of "... significant habitats of indigenous fauna".

[508] The whole melange of ecosystem protection in the RMA is confusing and could well be addressed in any review of the statute. Particularly concerning is that the local authority functions of maintaining indigenous biodiversity[612] are not reflected in Part 2 of the RMA. The only direct reference to this concept is in section 6(c) which has proved of limited effect given New Zealand's generally declining indigenous biodiversity[613]. We consider that the protection of habitats and ecosystems under the RMA at present is a matter for case-by-case assessment.

[509] In this case both the 550 MF and 900 MF options protect the habitat of trout better than the Status Quo. The 550 MF option represented by the *Galleries 550/1639* scenario meets the objective better than the *Races 900/2255* scenario. Dr Cowie explained "This is because it will lead to higher flows in the 18 kms of the river below the major irrigation off takes down to just upstream of the Ardgour [FR] ... for about 92% of the time during the irrigation season"[614]. These higher flows represent up to 18

612 Section 30(1)(ga) RMA for regional councils; section 31(1)(b)(iii) for territorial authorities.

613 *New Zealand's Environmental Reporting Series: Our Land 2018* Ministry for the Environment and Stats NZ (2018) retrieved from www.mfe.govt.nz.

614 B Cowie evidence-in-chief 199 [Environment Court document 46].

kms of better habitat for trout in the Lindis River. We accept that a *Galleries 900/2255* scenario would give similar or better result in that 18 kms stretch of the river but, as we have found, that scenario is fanciful on economic grounds.

[510] An important issue is what happens in the Crossing reach? It is clear that in very dry years the 900 MF option performs better than the 550 MF option in the Crossing reach: a flow of 450 l/s at the Clutha/Mata-Au confluence is preferable for the habitat than a flow of 100 l/s.

[511] There was considerable disagreement between the ecologists over the ability of trout to move through the Crossing reach during periods of low flow. We do not think much turns on this issue, because it is clear that trout survive and thrive in the Lindis River even under the status quo (when there is no connectivity in dry years). Ms Baker-Galloway emphasised also the duration of low flows. However, when cross-examined on this Dr Jowett stated that the duration of the low flows is not so important because the population drops and then adjusts. He referred to studies[615] by Mr Trotter:

> ... in his first survey he tagged 622 trout and the flow at that time was about cumec. After a couple of weeks the flow dropped to 400 litres per second and the number of trout in that particular reach dropped to 133, and that flow continued at about 400, well, it then dropped to about 300 and yet the numbers of fish stayed constant. So, there wasn't an increasing loss, in that first study there wasn't an increasing loss in fish. So, there was a, what that demonstrates is that the 622 fish were living in the amount of space available at the one cumec, but when it reduced to about 400 they were all compressed into a small area and some of them died for various reasons. But then there was little change after that.

[512] A related point was made by Dr Hayes[616] about trout fattening up in the good years when there is more water in the river. We prefer the evidence of these scientists to that of Mr Boyd, experienced as he is. He did not give evidence as an expert in the proceeding and while he referred to "scientific reports" he did not cite or even identify them. Mr Boyd said that the Angling Club wanted the river returned "... to a more natural state"[617]. Since there are trout in the river, that is a problematic concept as we have already outlined.

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615 Transcript (2018) p 351 lines 1-20.

616 Transcript (2018) p 469 lines 1-5.

617 R O Boyd evidence-in-chief 45 [Environment Court document 37].

[513] We have found on the balance of probabilities that the Lindis River is not important for the recruitment of trout to the Clutha River/Mata-Au and Lake Dunstan fishery. Consequently the habitat of trout is sufficiently protected under option MF 550, given the 18 kms of improved habitat above the Ardgour FR.

Conclusions

[514] There are no live issues under section 8 RMA in this proceeding as explained earlier.

[515] Returning to the matters of national importance in section 6 RMA we find that the protection of the Lindis River and its margins from inappropriate use and development is provided for by the 550 MF option, because the use of the water is not, on the facts and predictions before us, inappropriate.

[516] Weighing all the relevant considerations, we conclude that the 550 MF option achieves the purpose of the Act. In coming to that conclusion, we consider the most important factors are that, as our section 32 evaluation showed:

- the 550 MF option is a more efficient use of the water than the 900 MF option;
- the 550 MF option is nearly as effective as the 900 MF option in achieving the relevant objectives of the ORP:W and as effective in implementing the objectives of the NPSFM.

[517] Our assessment under Part 2 of the Act gives us no reason to depart from our preliminary conclusions under section 32 or under the intermediate statutory instruments.

9. Outcome

9.1 The section 293 application

[518] The ORC seeks that we approve a policy and rule under section 293 RMA as set out in subchapter 3.4.

[519] Dr Cowie commented[618] on the views of the opposing submitters (section 274 parties) as follows:

> Opposition to the raceways closing is primarily based on the submitters' view that the PC5A decision (900 l/s minimum flow an 1,200 l/s primary allocation) should be upheld by the Court. Otago Fish and Game assert that the galleries proposal with its associated 550 l/s minimum flow and 1,639 l/s primary allocation "do not achieve the policy framework" but give no reasons or explanation for that in their submission.
>
> Both Ms Keith and the Upper Clutha Angling Club seek that the raceways be closed in all circumstances. This position is not supported, as it is uneconomic to implement the galleries scheme with a minimum flow of 900 l/s.
>
> Otago Fish and Game asserted that the proposed rule relies on the content of individual consents which can be altered on a limited or non-notified basis and so the public may not get to input on future changes to these consents. This is not correct – no one can apply for a resource consent for a prohibited activity and any change to the policy and/or rule to change the activity status would have to go through a formal plan change process.
>
> One other matter raised by the Upper Clutha Angling Club was that a rule is also needed to require that the races be decommissioned. This is outside the scope of the Court's hearings, but the Council accepts that when the galleries scheme is fully implemented after the 5-year transition period, the races will then need to be decommissioned.

[520] We accept his evidence.

[521] We consider that the policy does not need to refer to prohibiting the take of water from the river by races. The latter is adequately covered by the proposed rule. Rather the policy should simply refer to discontinuing the grant of applications to take (and use) water through races.

[522] Accordingly, we consider the policy should be amended by deleting the reference to prohibition so that it reads (with a couple of other minor changes):

> To maintain the life-supporting capacity and enhance the natural character of the mainstem of the Lindis River by ceasing to grant (or renew) any water permits for the take and use of water from the Lindis River by the Tarras Race (NZTM 2000 E1323951, N5030895), the Ardgour Race (NZTM 2000 E1324150, N5032696), the Point Race (NZTM 2000 E1322752, N5028693) and the Begg-Stacpoole Race (NZTM 2000 E1315078 N5023649).

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618 B Cowie supplementary evidence Appendix 3 [10]-[13] [Environment Court document 46B].

[523] As for the rule, we are slightly troubled by the exceptions. We accept that the existing deemed water permits which are not the subject of LCG's application to the court in ENV-2018-CHC-155 should be excluded from the application of the rule until they expire on 1 October 2021. However, we understand that the exception for applications RM17.301.07 and RM17.301.09A is for temporary purposes (up to five years) to allow a smooth transition to LCG's gallery scheme. Accordingly, we consider the proposed rule should be amended to read:

> **Rule 12.0.1.5**
>
> The taking and use of water from the Lindis River by the Tarras Race (NZTM 2000 E1323951, N5030895), the Ardgour Race (NZTM 2000 E1324150, N5032696), the Point Race (NZTM 2000 E1322752 N5028693) and the Begg-Stacpoole Race (NZTM 2000 E1315078 N5023649) are prohibited activities, except as expressly allowed:
>
> (a) by deemed permits WR1753CR.V2 and WR7787/96CR.V2 until they expire on 1 October 2021;
>
> (b) for up to five (5) years from the commencement of any consent which may be granted under applications RM17.301.07 and RM17.301.09A (which are the subject of ENV-2018-CHC-155).

9.2 Fixing the minimum flow and primary allocation

[524] In the end we must make an integrated judgment which weighs all the matters identified as relevant and which in particular gives effect to any "bottom-lines" (*King Salmon*[619]) in the relevant instruments. Further, there is usually no need to have resort to Part 2 unless the objectives and policies of the regional plan being considered are invalid, uncertain or incomplete (*King Salmon*[620]). On the other hand we must not substitute the outcome of the section 32 evaluation for the synthesised or integrated judgment: *Meridian Energy Limited v Central Otago District Council*[621].

[525] To assist us in making that judgment we received expert evidence from three experienced planners: Ms Lojkine, Dr Cowie and Mr H R Familton for the DGC. The evidence of Ms Lojkine was rather undermined by her reliance on expert evidence which was either changed by the witness at the hearing or which we have not accepted. We prefer the evidence of Dr Cowie which supports the MF 550 option. It was not weakened in any significant way by cross-examination. Indeed, we were impressed by

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619 *King Salmon* above n 152 at [47] [103] and [132].

620 *King Salmon* above n 152 at [188].

621 *Meridian Energy Limited v Central Otago District Council* [2011] 1 NZLR 482; [2011] NZRMA 47 (FC).

Dr Cowie's overall grasp of the issues and evidence and his explication of them. We feel we can generally rely on his evidence while disagreeing slightly over some details. The evidence of Mr Familton was rather more relevant to the WPs decision.

[526] We have carefully considered how and the extent to which each of the options and their exemplifying scenarios gives effect to the objectives of the NPSFM and to the objectives and policies of the operative RPS and the partly operative PORPS. We have concluded that the relevant previsions are best given effect to in an integrated way by option 550 MF.

[527] At the highest level in the statutory hierarchy of documents to be given effect to in this case there are no clear avoidance policies as there were in *King Salmon*. That case was concerned with the unequivocal Policies 13 and 15 in the New Zealand Coastal Policy Statement. By contrast the objectives of the NPSFM which apply in this case are more guarded.

[528] There is one 'avoidance' policy[622] – in the ORP:W itself – but it requires us to "give priority to avoiding" adverse effects on the natural character of the Lindis River.

[529] The 900 MF option (at least in a galleries scenario) leaves more water in the river at low flows than the 550 MF option. That means that, at least in one rather implausible scenario, the 900 MF option is slightly better[623] than the 550 MF option from an ecological point of view, especially in the last 3.7 kilometres of the river before the Clutha/Mata-Au confluence at low flows. On the other hand, the *Races 900/1200* scenario would leave less water in the upper reaches (below the Lindis Peak FR) for a large proportion of the time and thus has more ecological adverse effects than the 550 MF option in terms of Policy 5.4.2 ORP:W.

[530] Considering the section 32 evaluation, a large, but not determinative, factor in this case is that the efficiency evaluation strongly favours the 550 MF option over the 900 MF option. In terms of the risks of acting or not acting[624], we consider that the door should not be closed to scenario *Galleries 550/1639* so that the LCG's application for a suite of water permits can be determined.

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622 Policy 5.4.2 ORP:W.

623 'Better' in this context means "more appropriate in achieving the relevant objectives and policies": section 32(1)(b) RMA.

624 Section 32(3)(c) RMA.

[531] Weighing all the matters in the way we set out in Chapter 8 (except for 8.6), and considering all the submissions and evidence – including that discussed in Chapters 1 to 7 – and the effect of the proposed order under section 293, we judge that:

- the minimum flow at the Ardgour FR should be fixed at 550 l/s; and
- the primary allocation should be fixed at 1,640 l/s

— because the 550 MF option is preferable to the 900 MF option when assessed against all the relevant considerations. When we also include Chapter 8.6 (consideration of Part 2 of the Act) we come to the same conclusion although less strongly.

[532] We add some closing comments about the witnesses and counsel. The standard of the expert evidence in this proceeding was generally high. Our only substantial criticism is over the plethora of models and scenarios. Future cases in the Otago Region will be expedited considerably if one model can be developed for the standard hydrographs and one model can be developed for the longitudinal picture of flows.

[533] We also appreciated the effort that the section 274 parties who appeared for themselves put into preparing their evidence. We have endeavoured to summarise their reasons fully and to state where we accept (or not) their evidence, and why.

[534] Last, we thank counsel for their full and careful guidance of the court, and courteous treatment of all the witnesses (both experts and lay persons). We benefitted greatly from the presence of senior counsel with long experience of the particular conditions of the Otago Region.

For the court:

J R Jackson
Environment Judge

THE SEAL OF THE ENVIRONMENT COURT OF NEW ZEALAND

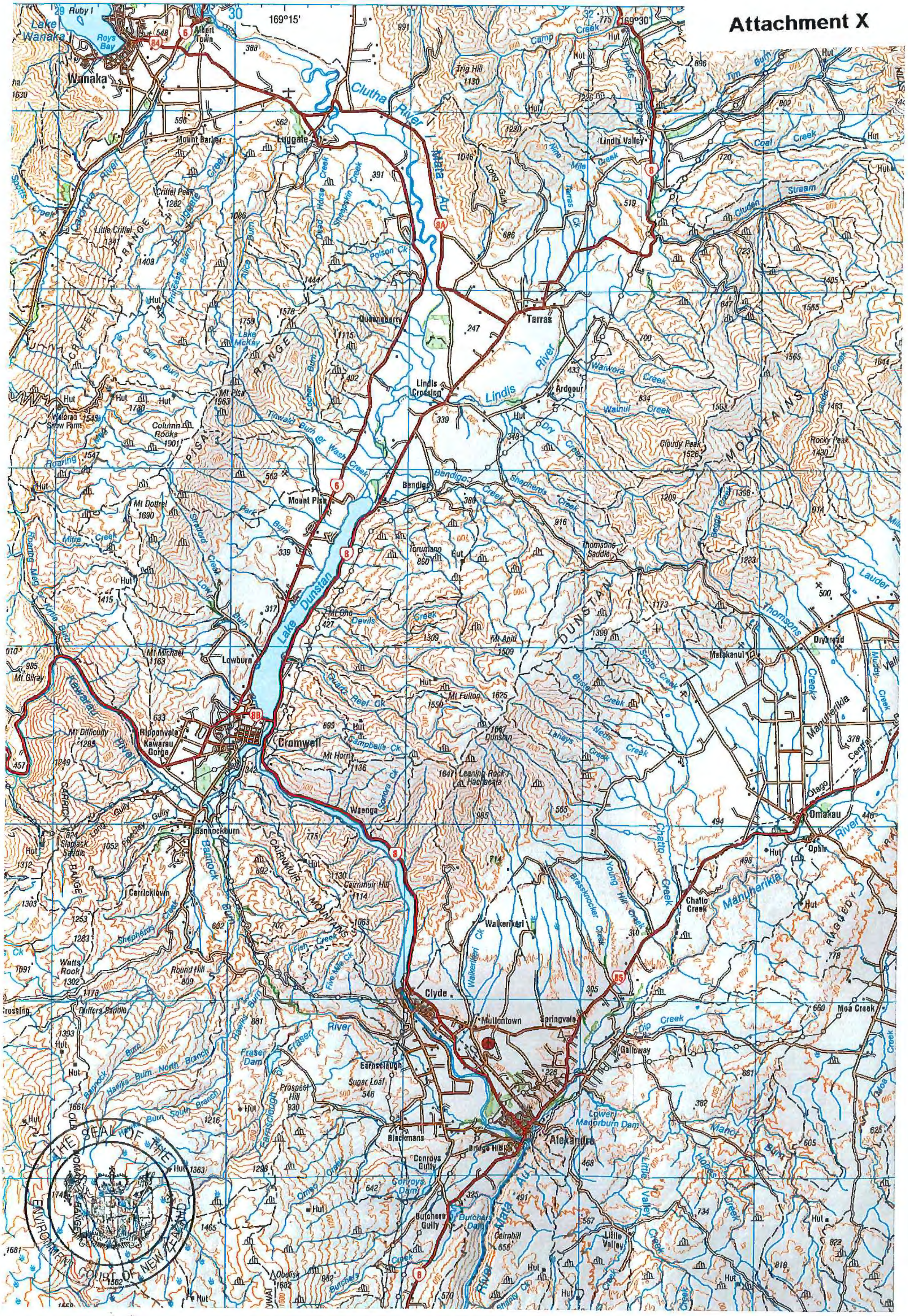
Attachments

X: Location map.

A: Map of the Lindis River: Ardgour and the Crossing reaches.

B: Mr Henderson's hydrographs Figures 12-15.

Attachment X



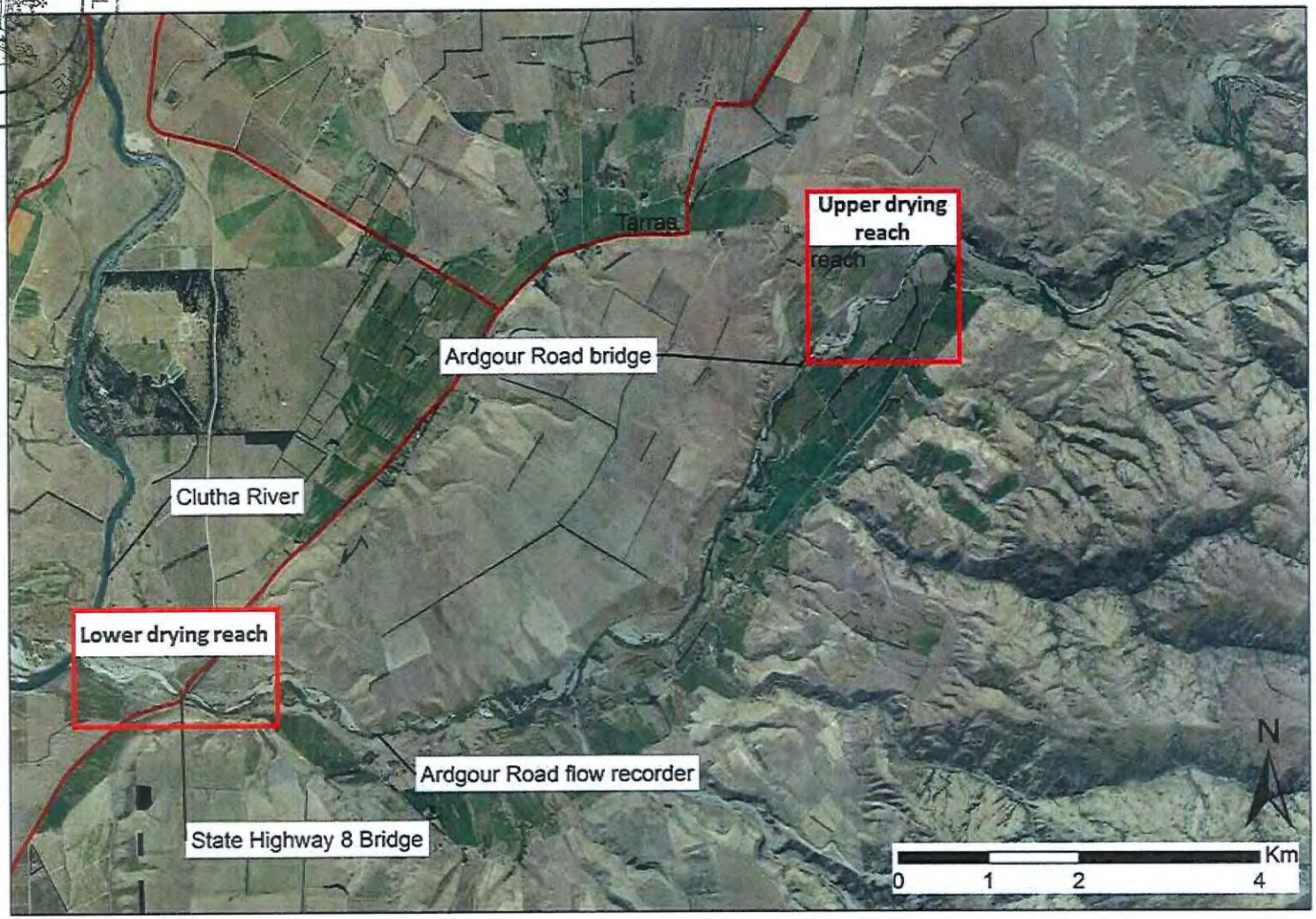


Figure 2 Map of the lower Lindis River showing the approximate extent of the upper and lower drying reaches.

Attachment A

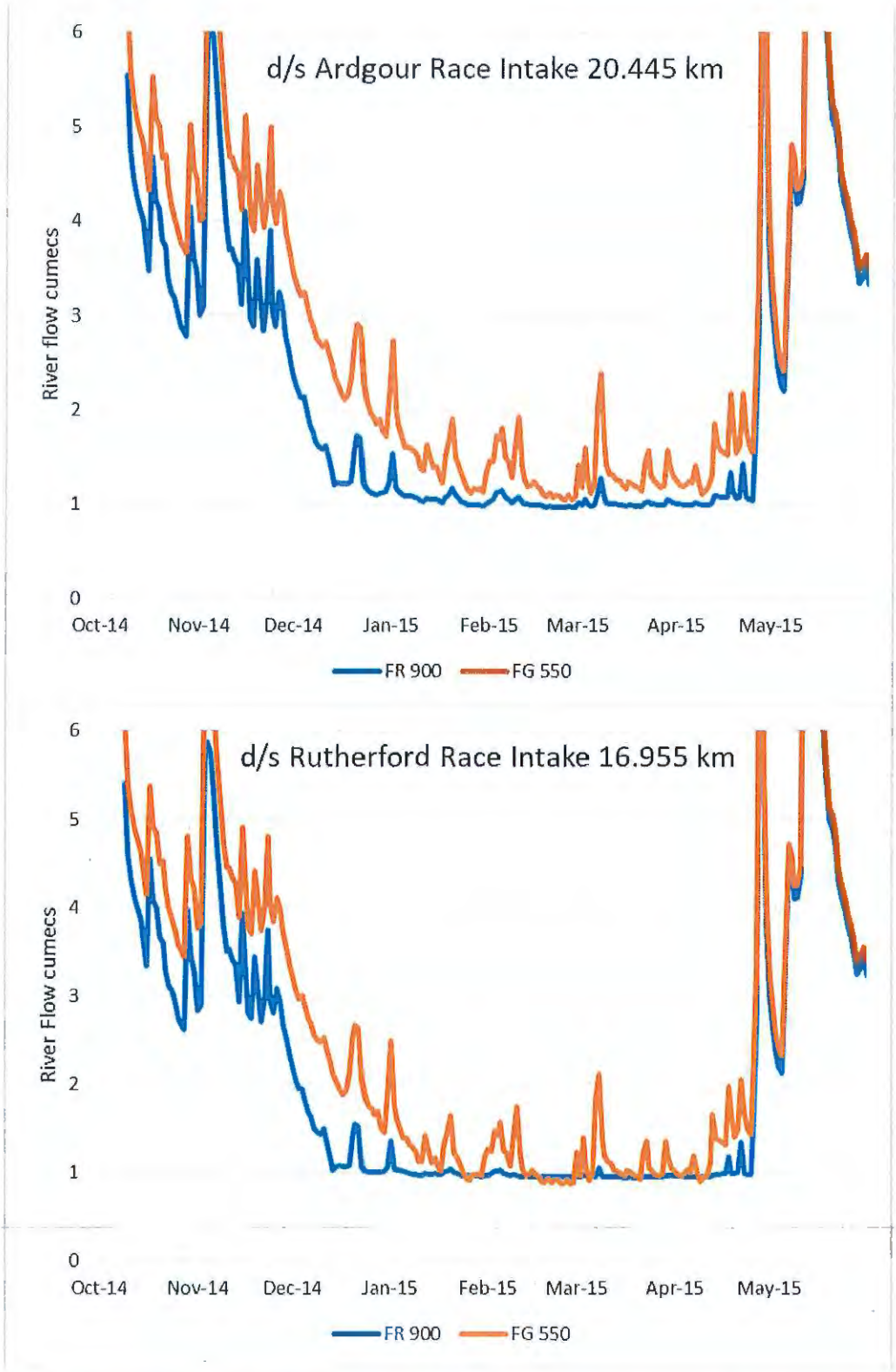


Figure 12: Flow hydrographs of the Future Races and the Future Galleries scenarios, at two locations along the Lindis River for the 2014/15 irrigation season.

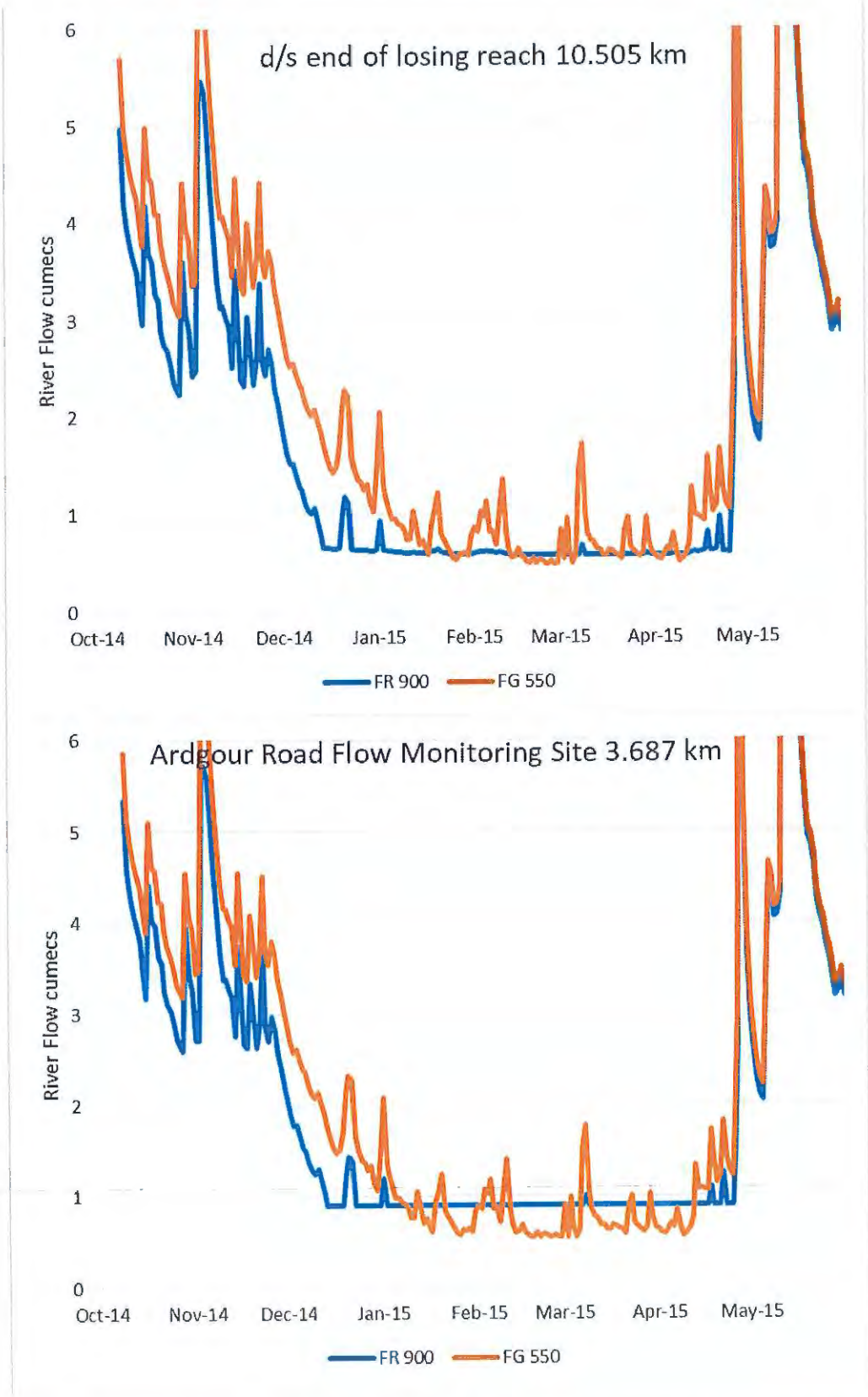


Figure 13: Flow hydrographs of the Future Races and the Future Galleries scenarios, at two locations along the Lindis River for the 2014/15 irrigation season.

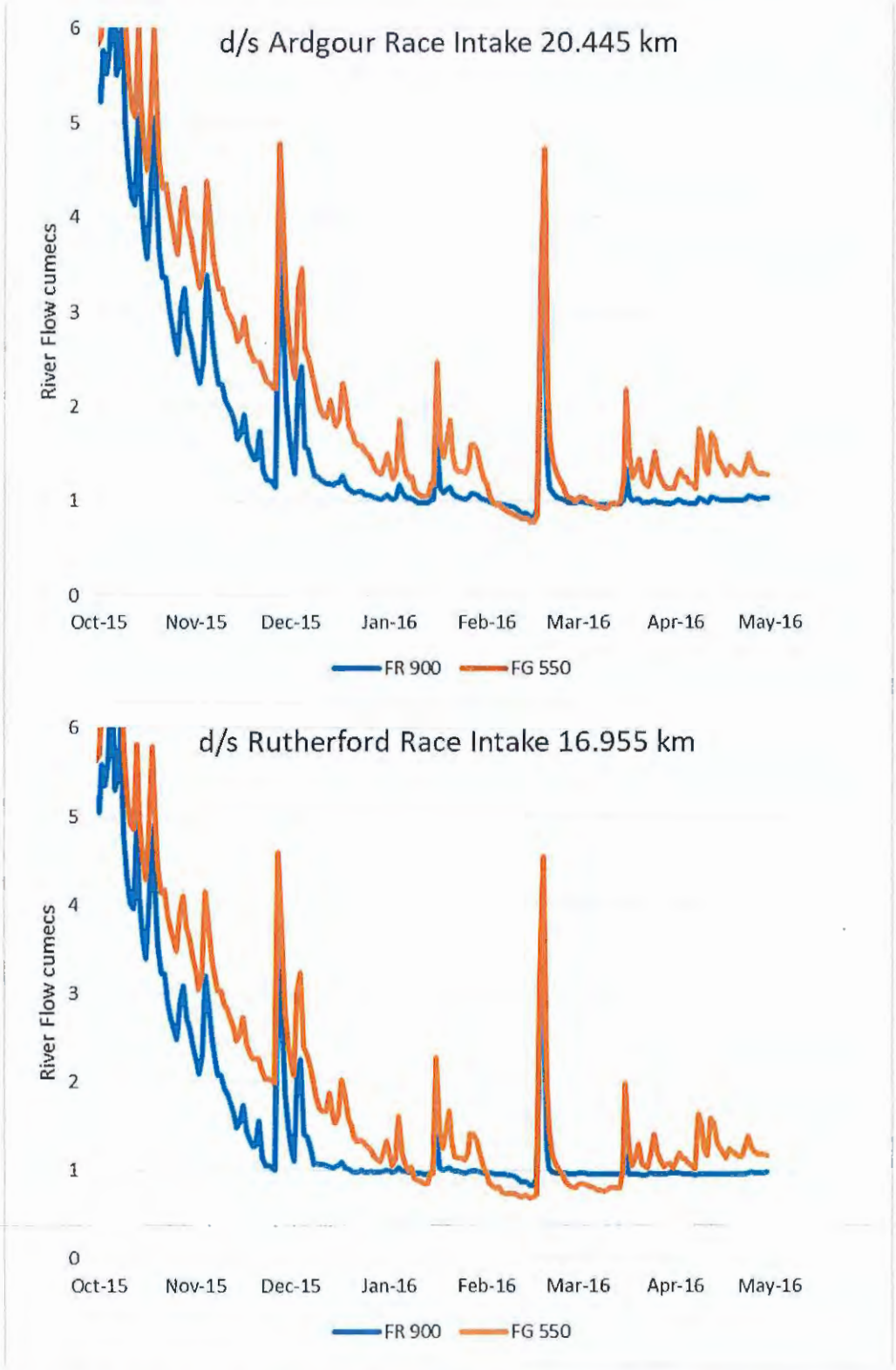


Figure 14: Flow hydrographs of the Future Races and the Future Galleries scenarios, at two locations along the Lindis River for the 2015/16 irrigation season.

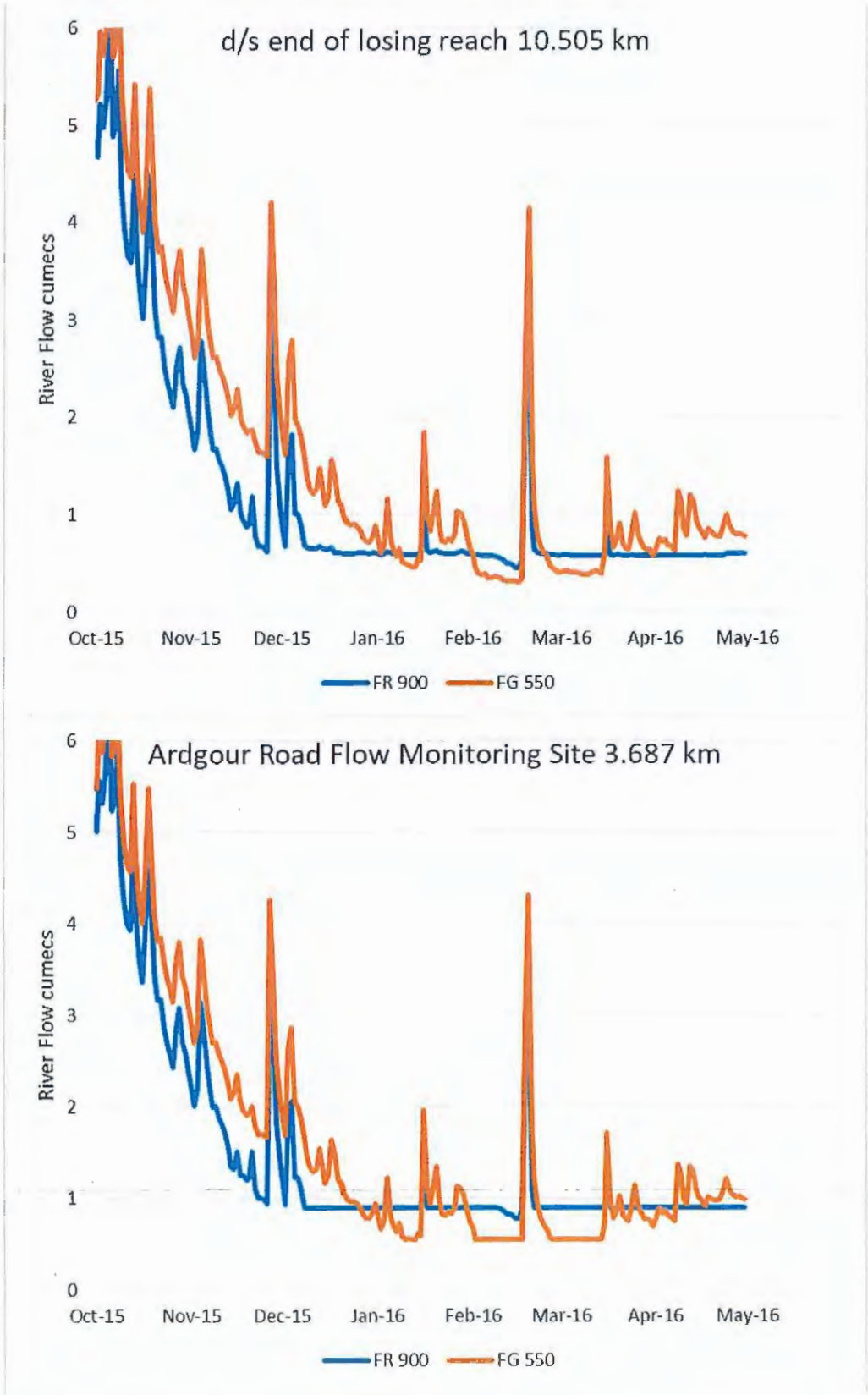


Figure 15: Flow hydrographs of the Future Races and the Future Galleries scenarios, at two locations along the Lindis River for the 2015/16 irrigation season.