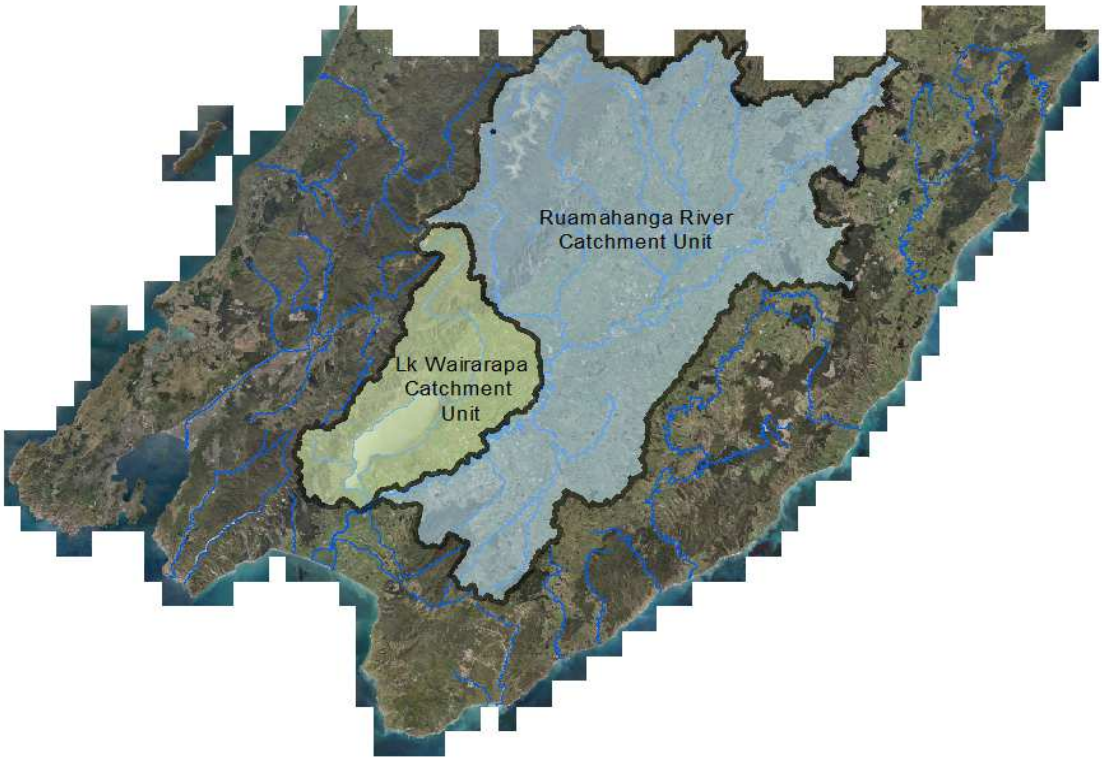
Information on water allocation and minimum flows provided to the Ruamāhanga Whaitua Committee June 2016

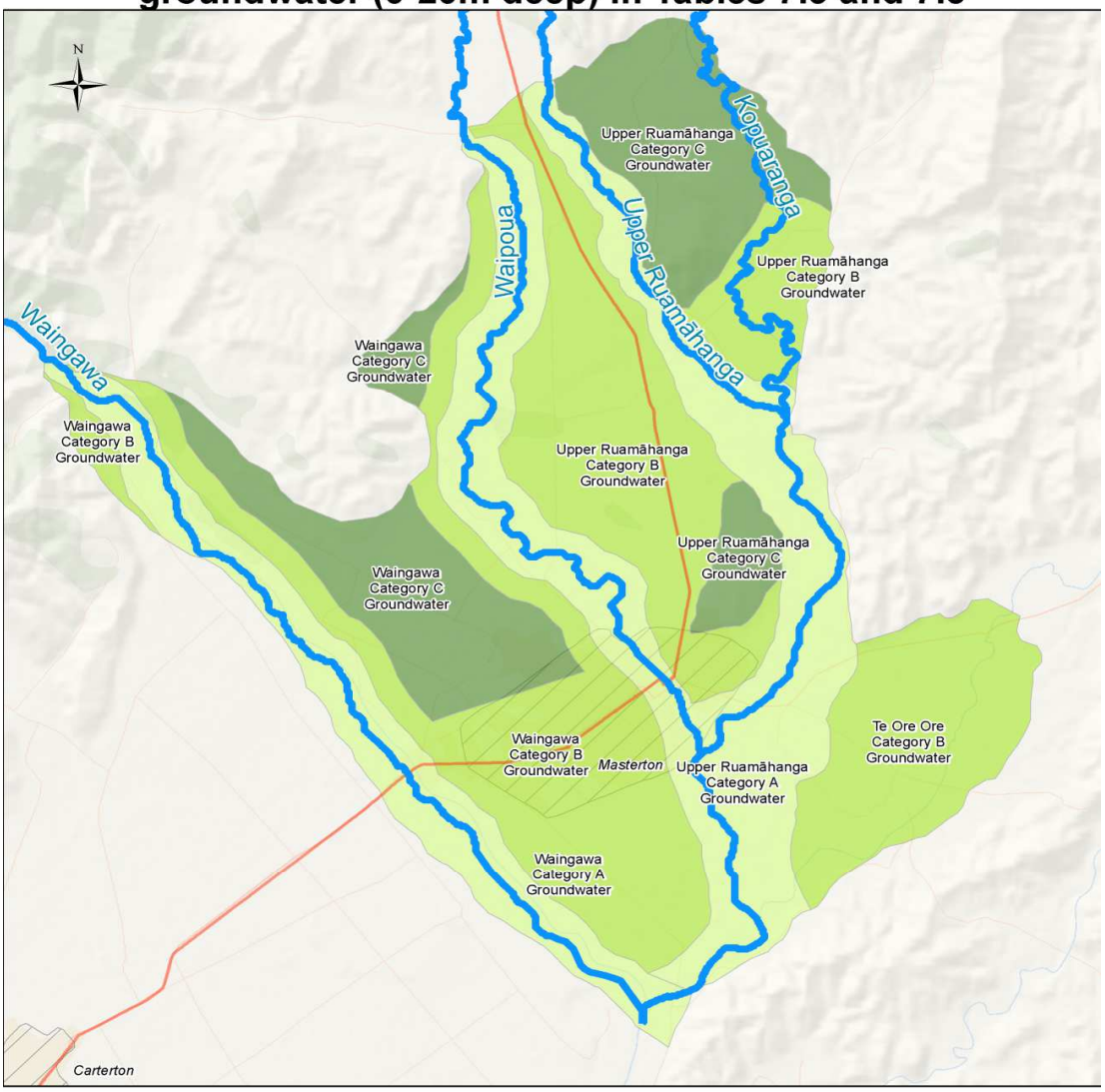
Current consented allocation and default allocation for catchment units



Catchment units	Current allocation (L/s)	Default allocation (L/s)	Percentage allocation existing/ default
Ruamāhanga River and tributaries, (not including Lake Wairarapa), directly connected groundwater	7,953	7,535	106%
Lake Wairarapa and tributaries, directly connected groundwater	1,826	1,800	103%

Current consented allocation, default allocation, reliability of supply and permitted water for stock and domestic: Upper Ruamāhanga catchment sub-units

Figure 7.2: Upper Ruamāhanga catchment - rivers and groundwater (0-20m deep) in Tables 7.3 and 7.5



This version of the map is not complete. The version of this map available online through the online web map viewer shows the complete, detailed information on a GIS overlay that is not shown on this hard copy. The online version is available on the Council's website at http://mapping.gw.govt.nz/gwrc/ (select theme Proposed Natural Resources Plan 2015) and can be accessed from the Council offices or public library.

State Highway
River
Urban Areas
Category A groundwater
Category B groundwater
Category C groundwater

0 1.25 2.5 5 km
1:100,000

Basemap: World Oceans Base
Projection: NZTM 2000

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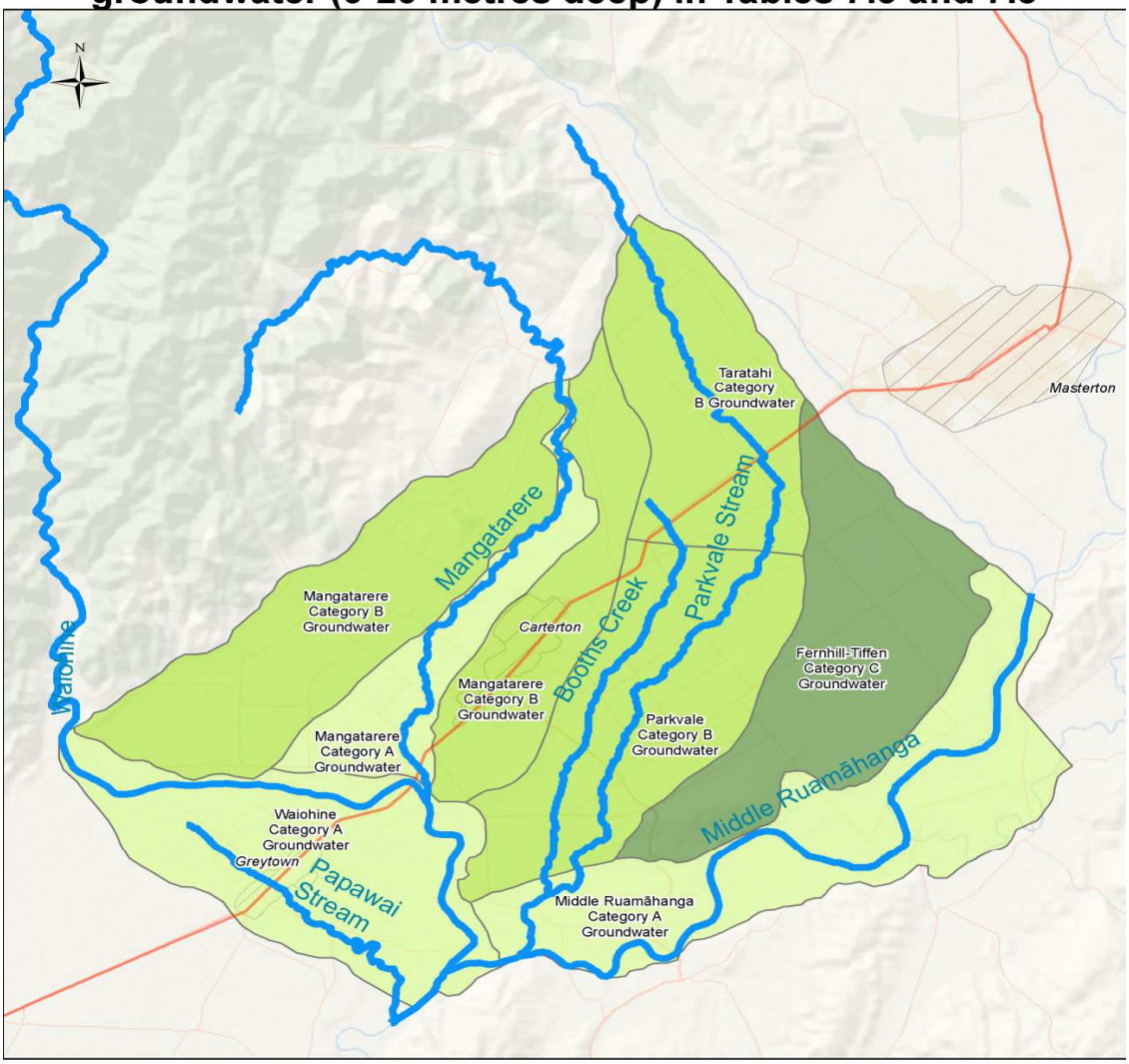
Catchment management sub-unit	Current allocation (L/s)	Default allocation (L/s)	Percentage allocation existing/ default	Average days/year without consented water [Average % reliability]	Permitted stock and domestic (L/s)
Kopuaranga River and tributaries, directly connected groundwater	150	180	83%	n/a	17
Waipoua River and tributaries, directly connected groundwater	129	145	89%	18 [90%]	10.5
Waingawa River and tributaries, directly connected groundwater	1197	920	130%	27 [85%]	0.5
Upper Ruamāhanga River and tributaries, directly connected groundwater	954	1,200	80%	8 [96%]	15

Current consented allocation, default allocation, reliability of supply, and permitted water for stock and domestic: Middle Ruamāhanga catchment sub-units

Figure 7.5: Middle Ruamāhanga catchment - rivers and groundwater (0-20 metres deep) in Tables 7.3 and 7.5



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State Highway
River
Urban Area
Category A groundwater
Category B groundwater
Category C groundwater

0 1.5 3 6 km
1:125,000

Basemap: World Oceans Base
Projection: NZTM 2000

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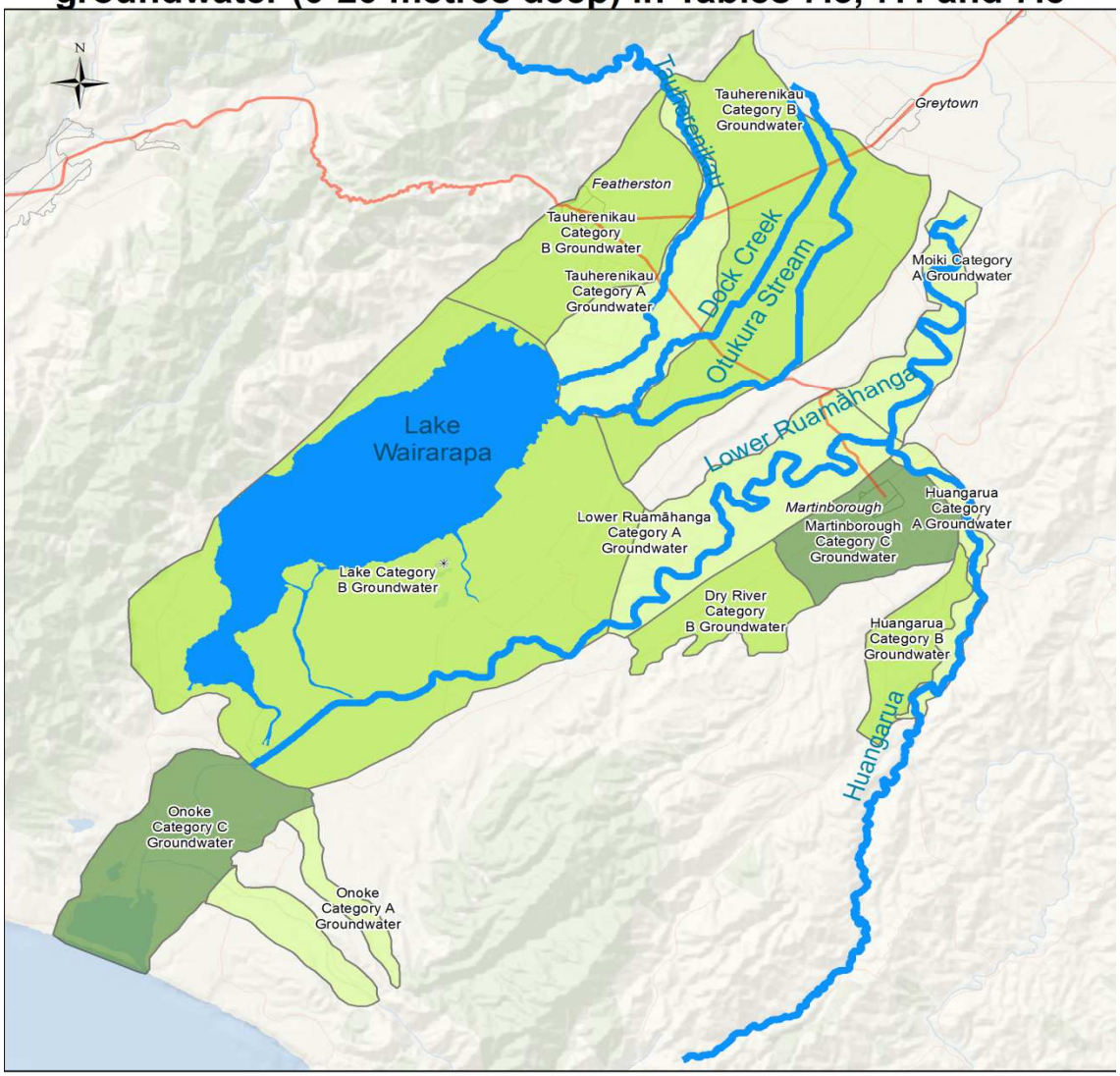
Catchment management sub-unit	Current allocation (L/s)	Default allocation (L/s)	Percentage allocation existing/ default	Average days/year without allocation [Average % reliability]	Permitted stock and domestic (L/s)
Parkvale Stream and tributaries, directly connected groundwater	151	40	372%	42 [77%]	10.4
Booths Creek and tributaries, directly connected groundwater	109	25	436%	42 [77%]	
Mangatarere Stream and tributaries, directly connected groundwater	430	110	435%	37 (upper) 22 (lower) [80%] [88%]	19.6
Waiohine River and tributaries, directly connected groundwater	1003	1590	63%	4 [98%]	1.3
Papawai Stream and tributaries, directly connected groundwater	340	65	523%	51 [28%]	1.2
Middle Ruamāhanga River and tributaries, directly connected groundwater	974	1,240	79%	10 [94%]	48.5

Current allocation, default allocation, reliability of supply, and permitted water for stock and domestic: Lower Ruamāhanga catchment sub-units

Figure 7.8: Lower Ruamahānga - rivers and groundwater (0-20 metres deep) in Tables 7.3, 7.4 and 7.5



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State Highway
Urban Area
Category A groundwater
Category B groundwater
Category C groundwater
* Lake category B groundwater is to a depth of 15 metres

0 2.5 5 10 km
1:193,629

Basemap: World Oceans Base
Projection: NZTM 2000

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Catchment management sub-unit	Current allocation (L/s)	Default allocation (L/s)	Percentage allocation existing/ default	Average days/year without allocation [Average % reliability]	Permitted stock and domestic (L/s)
Huangarua River and tributaries, directly connected groundwater	92	110	83%	n/a	15.5
Lower Ruamāhanga River and tributaries, directly connected groundwater	2447	1,475	165%	10 [94%]	22
Otukura Stream and tributaries, directly connected groundwater	140	30	466%	41 [77%]	10
Tauherenikau River and tributaries, directly connected groundwater	233	410	57%	12 [93%]	0.2

Current consented allocation, default allocation and permitted stock and domestic water for groundwater not directly connected to surface water

Ruamāhanga catchment groundwater sub-units	Current allocation (m^3/year)	Default allocation (m^3/year)	Percentage allocation current/ /default	Permitted stock and domestic (m^3/year)
Te Ore Ore	813,000	480,000	169%	11,406
Waingawa	725,000	1,900,000	38%	53,910
Upper Ruamāhanga	572,000	3,550,000	16%	41,358
Fernhill-Tiffen	1,361,000	1,200,000	113%	2,600
Taratahi	318,000	1,400,000	22%	4,369
Parkvale (unconfined)	340,000	350,000	97%	22,109
Parkvale (confined)	2,162,000	1,550,000	139%	8,509
Mangatarere	2,548,000	2,300,000	110%	138,571
Tauherenikau	4,745,000	6,600,000	71%	120,921
Lake	5,901,000	6,750,000	87%	407,145
Huangarua	650,000	650,000	100%	6,148
Martinborough	942,000	800,000	117%	16,922
Dry River	427,000	650,000	65%	42,772
Onoke	1,058,000	2,100,000	50%	83,072

Derivation of minimum flows in the Ruamāhanga River catchment.

General approach

Minimum flows have been set in a variety of ways from default values based on flow statistics to catchment specific investigations. In general, more rigour has been applied where demand for water is highest. Many minimum flows originate from 'Catchment Management Plans' developed throughout the 1980s, 90s and 2000s. These plans usually drew on a combination of river habitat survey (IFIM) and water quality modelling (WAIORA) data as well as knowledge of river values and uses at the time. The approach taken for specific rivers and streams is described in more detail in Table 1.

What is IFIM?

Instream Flow Incremental Method (IFIM) is a tool for determining physical habitat requirements under different flow regimes. It uses fish and invertebrate habitat suitability curves to describe relative habitat quality ranging from zero (unsuitable) to one (optimum). It has a long history of use for minimum flow setting throughout New Zealand, beginning in the 1980s and 90s, and is still used in various forms today. It is most suited to larger rivers rather than small streams. An important point is that the user must make a judgement about what level of habitat retention is desirable in order to set the minimum flow. Many of the minimum flows in the Wellington region are partly based on IFIM assessments in the 1990s that used the 'two thirds' rule that was accepted at the time; that is, minimum flows should aim to preserve two thirds of the habitat that is available at MALF. More recent thinking indicates that habitat preservation of 80-90% of MALF might be more appropriate, especially when dealing with quite highly allocated catchments. However, there are no 'correct' answers and desirable level of habitat retention can vary significantly depending on identified values.

What is WAIORA?

Water Allocation Impacts on River Attributes (WAIORA) is a model developed by NIWA that, like IFIM, provides guidance on physical habitat but it also predicts other environmental responses to flow change (such as dissolved oxygen and water temperature). These responses can be related to guideline thresholds for ecosystem health to help understand the impact of flows and allocation scenarios. Some caution has been exercised in the interpretation of WAIORA results for flow setting as the tool was in its development stage when applied in the Wellington region.

Recent methods

More recent instream flow assessments by GWRC (Otukura and Papawai streams, Lower Ruamāhanga, Waiohine and Tauherenikau rivers) have also used IFIM and water quality modelling techniques but have applied more conservative criteria in some areas, especially habitat retention, in accordance with advances made in flow setting methods in NZ.

Limitations of PNRP minimum flows

Minimum flows in the PNRP include 8 minimum flows from the Regional Freshwater Plan and 3 additional river minimum flows. There are some limitations of the existing PNRP minimum flows to be aware of:

- There is a heavy focus on physical habitat in assessments of minimum flows to date. Other variables and values have been considered to varying degrees (and sometimes accounted for) but, overall, minimum flows do not reflect fully comprehensive and holistic consideration of river values and uses. Explicit objectives relating to expanded definitions of habitat/river quality, and values such as those associated with cultural use and reliability of supply are needed to test the suitability of existing minimum flows (and possible alternative regimes).

- Early catchment management plans generally only considered allocation impacts associated with direct river takes and obvious connected groundwater takes when appraising minimum flows. On a related note, the plans also often referenced minimum flows against observed low flows rather than flows that have been adjusted to reflect a 'natural' reference state.

- Minimum flows within the Ruamāhanga catchment have been developed at different stages on a sub-catchment basis. While this may remain an appropriate scale for managing sub-catchment flows, there may also be opportunity to better consider how all minimum flows interact at the whole of Ruamāhanga catchment scale.

Table 1. Minimum flow derivations

River/stream	Management point	Minimum Flow [Restrictions on]	Proportion of natural 7d MALF	Basis
Upper Ruamāhanga River	Wardells	2,400 L/s [2,700 L/s]	67%	IFIM modelling in 1993 identified flow requirements for sustaining minimum food producing and adult brown trout habitat. WAIORA modelling (in 1998/99), as well as consideration of some recreational values (boating, tubing, kayaking), supported the minimum flow of 2,700 L/s and 2,400 L/s.
Lower Ruamāhanga River	Waihenga Bridge	8,500 L/s [9,800 L/s]	68%	Originally the minimum flow was based on a rule of thumb (flow statistic). A more thorough assessment of instream values and an IFIM study was conducted in 2007. It considered a wider range of fish species (as well as recreational values) and identified that adult brown trout had the highest flow demands and that the minimum flow of 8,500 L/s was appropriate for retaining approximately 90% of adult brown trout habitat available at MALF.
Waingawa River	Kaituna	1,100 L/s [1,700 L/s]	80%	Minimum flow established by the Waingawa Catchment Management Plan in 1988 with reference to swimming suitability and dilution of effluent from the Waingawa Freezing Works. IFIM study of two river reaches (Kaituna and the lower river near Masterton) was carried out in 1993 and confirmed the adequacy of the minimum flow for sustaining fish habitat space. A more recent reassessment of the original IFIM survey data against recently developed criteria also suggests that the minimum flow is broadly adequate, although only

				physical habitat space was considered. An important point to note is that currently all non-essential takes (including irrigation takes) from the river are required to cease at the higher flow (1,700 L/s) which is well above MALF.
Waipoua River	Mikimiki Bridge	250 L/s [300 L/s]	68%	Minimum flow established by the Waipoua Catchment Management Plan in 2001, primarily on the basis of WAIORA modelling and survey of two reaches in the mid and lower sections. Relative to other small rivers, the minimum flow is quite low as a proportion of 7dMALF.
Waiohine River	Gorge	2,300 L/s [3,040 L/s]	65%	Minimum flow is based on some limited IFIM survey in 1993 as well as correlation of flows with the Ruamāhanga River. The early IFIM work identified used food producing and adult brown trout habitat as the reference point for flow setting. A more thorough assessment of instream values and IFIM survey was carried out in 2009. It considered a range of recreational and cultural values although specific objectives were ultimately linked to fish habitat and migration. The recommendation of that study was to increase the minimum flow to 2,765 L/s.
Tauherenikau River	Gorge	1,100 L/s [1,350 L/s]	85%	Minimum flow is based on some limited IFIM survey in 1993 as well as a Catchment Management Plan from 1984. An assessment of instream values and generalised habitat

				survey was carried out in 2011. That study considered the existing minimum flow to be generally adequate for supporting values associated with physical habitat and fish passage.
Mangatarere River	Gorge	240 L/s - Upper 200 L/s - Lower	145% 120%	IFIM and WAIORA modelling was carried out in 2002 and informed minimum flow recommendations made in a 2003 Catchment Management Plan. The overall instream flow management objective was to "*enhance water quality, maintain water quantity and support trout habitat, fishing/spawning and aquatic ecosystems*". Adequate dilution of the Carterton Wastewater discharge at low flows was also considered.
Kopuaranga River	Gorge	270 L/s	90%	WAIORA modelling was carried out in 1998/99 and recommended 250 L/s as a minimum flow. This was based on habitat availability and water quality predictions, taking into consideration the dilution requirements of effluent discharges at the time. The WAIORA minimum flow was subsequently revised upwards slightly to ensure adequate water depth for rout migration.
Papawai Stream	Fabians Road	180 L/s	75%	Minimum flow based on recommendations made in an instream flow assessment study in 2009. Study focused on both habitat and water quality and flow setting addressed three main objectives: habitat for long fin eels, maintenance of dissolved oxygen levels for ecosystem support and suitability of swimming (especially at Papawai Marae).

Otukura Stream	Weir	95 L/s	90%	Instream flow assessment study in 2007. Objective of the minimum flow recommendation was to help improve the ecological values of the Otukura Stream and Battersea Drain. WAIORA modelling used to predict impacts on water temperature and dissolved oxygen especially.
Parkvale Stream	Weir	100 L/s	70%	No site or catchment specific study. Minimum flow set by rule of thumb to be broadly consistent with other highly allocated small stream catchments.