Waipaoa Catchment Planning Advisory Group – Hui 7

Date: 24 April 2024

Title of report: Water quantity issues in the Waipaoa Catchment - development of limits and targets

Report no: 1

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Purpose of this report

This report sets the scene for the development of the water quantity provisions in the Waipaoa Catchment Plan. It provides this Advisory Group (the Group) with:

- information around the current minimum flow and allocation limits and targets in the Plan
- the scientific evidence that will be used to develop proposed new minimum flows, allocation limits and targets.

Outcomes sought

Members of the Advisory Group:

1. Understand the current water allocation issues in the Waipaoa Catchment;
2. Are aware of, and to a degree, understand the updated scientific evidence relevant to minimum flows and allocation limits.

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1. Background

In resource management the term "water quantity" is used to describe the amount of water present in our freshwater bodies (both surface water and groundwater). Water quantity naturally varies with climate, land cover, the underlying geology and over time. However, water quantity is also influenced by human activities, such as abstracting water, changing land cover or damming waterbodies.

In Hui 7, 8 and 9 we will be discussing issues and options for water quantity management in the Waipaoa catchment.

Under the National Policy Statement for Freshwater Management 2020 (NPS-FM), managing water quantity is important for achieving environmental outcomes and long-term visions. Council is required to set environmental flows and levels having regard to the foreseeable impacts of climate change and manage water abstraction within take limits.

Water quantity management often involves reference to several technical terms or concepts that are fundamental to understand how management regimes protect freshwater values. The most common terms we will be using in our discussions are defined in **Appendix A**. These terms are:

- Environmental flows
- Environmental level
- Take limit
- Management flow
- Residual flow
- Mean annual low flow
- Freshwater management unit

Throughout this paper and water allocation conversations going forward, there are two commonly used metrics:

- Litres per second (L/s) which describes the rate at which water is being taken or is moving within a river system; and
- Cubic metres (m^3) describe the total volume of water within a system.

2. Setting the scene- the National Objectives Framework

This work is part of the second stage of implementing the National Objectives Framework (NOF).

Stage 1: Identifying aspirations and goals for freshwater

- Identifying freshwater values
- Defining Freshwater Management Units
- Setting environmental outcomes
- Identifying a Long-Term Vision

Stage 2: Identifying how and when to achieve those goals

- Understanding attributes and baseline states
- Setting targets and timeframes

- Setting limits, methods and actions **– we are here**
- Monitoring

3. How is water quantity currently managed in the Waipaoa Catchment Plan?

Water quantity in the catchment is managed in accordance with the rules set out in the Tairāwhiti Resource Management Plan (TRMP). The limits for minimum flows on rivers, and allocation from all water sources is set in the current Catchment Plan, and the limits and allocation vary from water source to water source.

3.1 Water quantity zones

To help set appropriate limits and targets for different water sources within the catchment, Council introduced Water Quantity Zones in the current Waipaoa Catchment Plan. Water Quantity Zones group 'like' water sources together so that limits and targets can be more easily managed.

Water Quantity Zones are typically:

- Tributaries of the same river; or
- Hydraulically connected surface and groundwater bodies; or
- Hydraulically connected groundwater bodies; or
- Miscellaneous surface water and groundwater grouped together where there are few; or
- No water takes.

Figures 1 and 2 show the Water Quantity Zones in the current plan:

- Waipaoa Surface water Quantity Zone: the Waipaoa River, Shallow Fluvial Aquifer and Waipaoa Gravels Aquifer
- Deep Groundwater Zone: Makauri and Matokitoki Aquifers
- Te Hapara Sands Aquifer
- Upper Te Arai (above Pykes Weir)
- Lower Te Arai (below Pykes Weir).

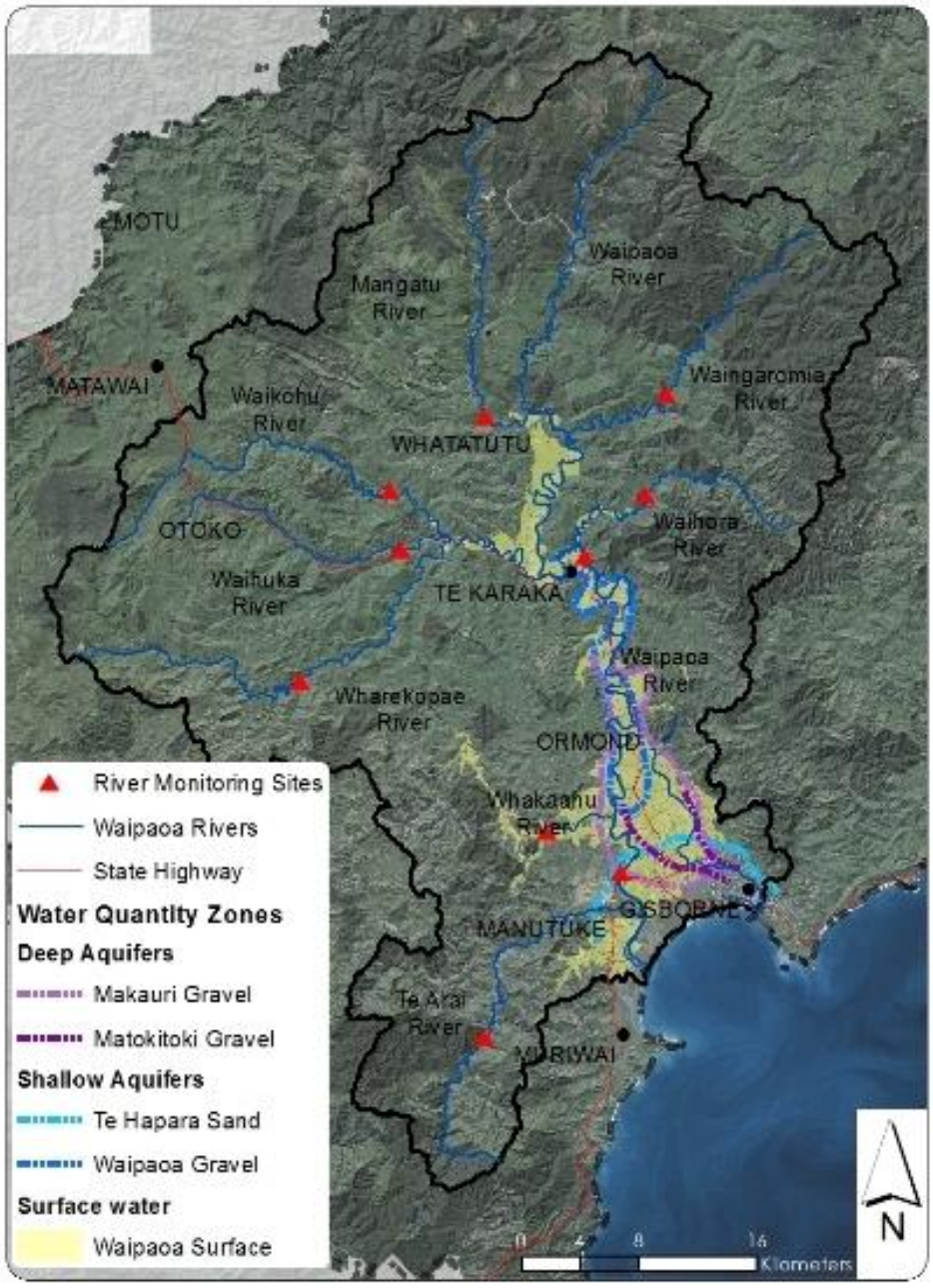
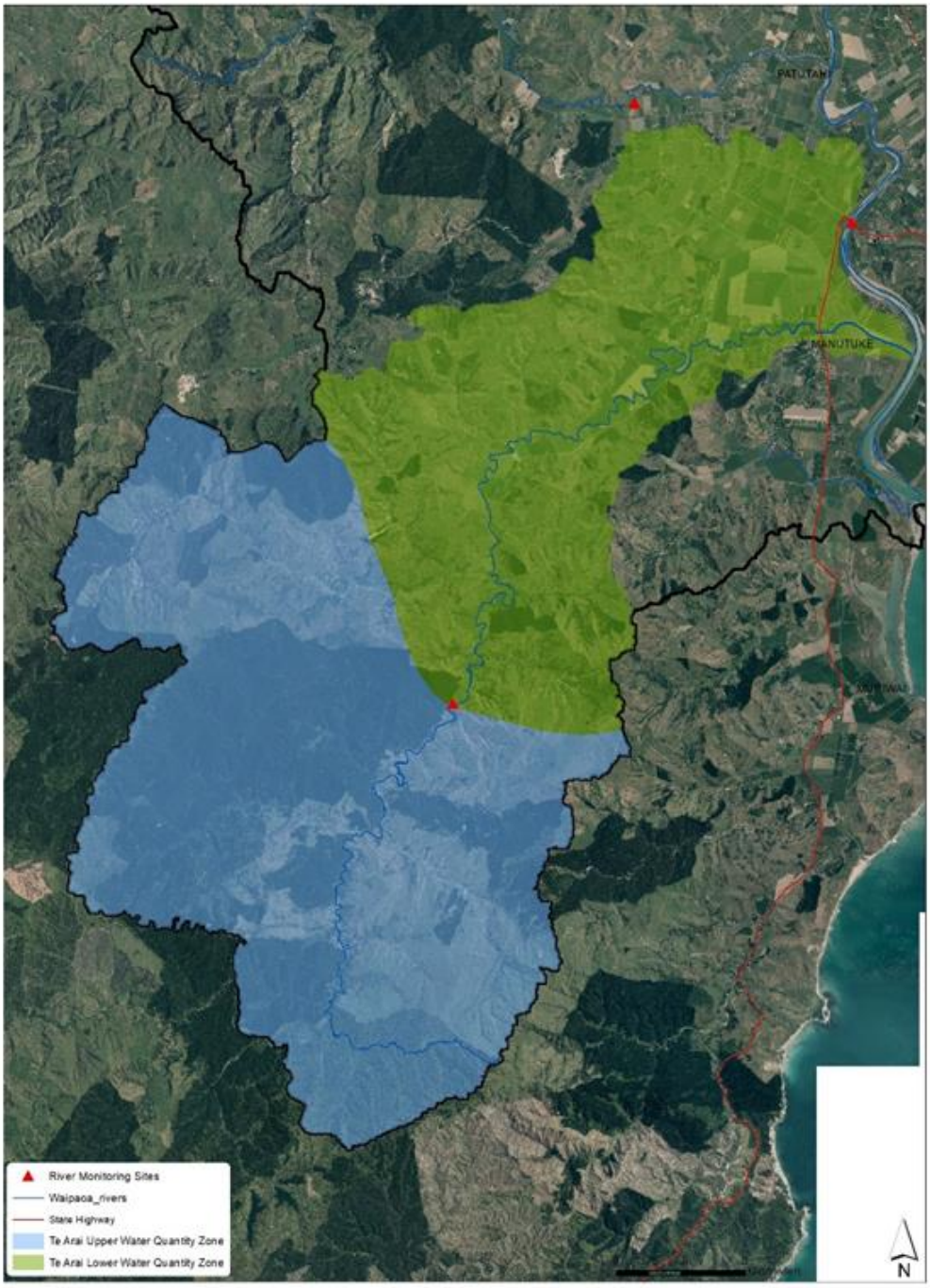


Figure 1: Current water quantity zones in the Waipaoa Catchment area. This will be updated through the Waipaoa Catchment Plan review.



Te Arai Water Quantity Zones

Figure 2: Current water quantity zones in the Te Arai FMU area. This will be updated through the Waipaoa Catchment Plan review.

The Water Quantity Zones will be updated through the Waipaoa Catchment Plan review.

3.2 Minimum flow and allocation limits

The current Waipaoa Catchment Plan minimum flow and allocation limits are shown in **Table 1** below:

Table 1: Minimum flow and allocation limits for each FMU in the current Waipaoa Catchment Plan.

Freshwater Management Unit	Water Quantity Zone	Minimum Flow A Block	Total Allocation A Block	Minimum Flow B Block	Total Allocation B Block
Waipaoa Hill Country		No A Block		4000L/s	2000L/s
Te Arai	Upper Te Arai	No minimum flow or allocation set. All takes require consent.			
	Lower Te Arai	60L/s	70L/s	220L/s	100L/s
		Reduction target to achieve total annual Te Arai A block allocation of 164,000m^3 by 2020			
Poverty Bay Flats	Waipaoa River*	1300L/s	2000L/s	4000L/s	2000L/s
		Reduction target to achieve total Waipaoa A Block Allocation to 6,267,500 m^3 by 2020			
	Deep groundwater	Reduction targets to achieve an annual allocation of 567,648m^3 in the Matokitoki Aquifer by 2025. Reduction targets to achieve an annual allocation of 1,702,944m^3 in the Makauri Aquifer by 2025.			
	Te Hapara Sands	Reduction targets to achieve an annual allocation of 295,000m^3 by 2020.			

*An allocation and minimum flow also provided for rootstock survival water.

The Waipaoa Catchment Plan sets minimum flows for the Te Arai River Water Quantity Zones at Pykes Weir, and at Kanakanaia Bridge on the Waipaoa River for the takes from the Waipaoa Surface water Quantity Zone. No other minimum flows are set within this catchment; however, Council can add additional minimum flow controls to takes on tributaries through the consent process.

Alongside the minimum flows, the catchment plan sets allocation blocks (maximum amount of water able to be taken by all users combined).

The Waipaoa Catchment Plan requires a minimum flow to be set on the Te Arai River at the water supply intake by 2026. The scientific investigations behind setting a minimum flow is underway and more detail on this is provided later in this report.

There are no limits or minimum flows set for smaller waterbodies such as the Taruheru River or Waikanae Stream. This means all applications to take water from these waterbodies is a Discretionary[1] Activity and the default flow setting methodology applies.

[1] A discretionary activity requires a resource consent before it can be carried out. Council can exercise full discretion as to whether or not to grant consent and as to what conditions to impose on the consent if granted.

4. Current limits and targets and progress to meeting this

Most of the consented water abstraction in Tairāwhiti occurs within the Waipaoa catchment.

Under the TRMP, resources are allocated on a first in, first served basis. The TRMP provides for those existing consent holders to have their permits renewed on expiry, subject to a resource consent process. This provides certainty of access to water for those existing users which is particularly important for business investment. However, in areas of high-water demand, this can make it challenging for new water users to get a water take consent.

The RMA (or the TRMP) doesn't enable Council to prioritise who gets allocated water from a waterbody. This means that Council cannot give preference to potential or current water users that may have a lower environmental footprint or higher value use than other water users.

Since notification of the 2015 Waipaoa Catchment Plan, where limits and targets were first introduced, resource consents for water takes have been renewed by water source and in most instances were renewed for five-year periods, meaning all consents have been renewed at least once. This was in line with the policy direction for fully and over allocated water bodies, and to enable the five-yearly reductions indicated in the catchment plan.

The current allocation of water for each source based on current water permits issued as of September 2023 is:

- Waipaoa A Block: 1,904.32L/s - **(95% of take limit)**
- Waipaoa B Block: 958.16L/s - **(48% of take limit)**
- Waipaoa River – total A Block Allocation: 22,457,438.10m^3 **(358% of take limit)**
- Te Arai A Block: 64.8L/s - **(93% of take limit)**
- Te Arai B Block: 63.15L/s - **(63.15% of take limit)**
- Te Arai River – total A Block Allocation: 235390m^3 **(144% of take limit)**
- Matokitoki Aquifer: 274,500m^3 - (**48% of take limit)**
- Makauri Aquifer: 1,771,942m^3 - **(104% of take limit)**
- Te Hapara Sands: 540,485m^3 - **(183% of take limit)**

While good progress has been made in reducing the total allocation in the aquifers and in reducing total allocation for the Te Arai and Waipaoa rivers, not all targets have been met.

There is also a significant waiting list for water in most sources but particularly the Waipaoa A Block.

5. New science and understanding minimum flows and groundwater availability

The limits and targets within the current Waipaoa Catchment Plan were guided by the report '*Review of flow records and estimates for the mean annual seven-day low flow (MALF) for the Waipaoa and Te Arai Rivers*' (2010) prepared by NIWA.

In preparation for the Waipaoa Catchment Plan review, Council contracted NIWA to:

- review the river level data for both Te Arai and Waipaoa Rivers

- provide environmental flow options to support instream values.

The objective of NIWA's review was to determine how different minimum flow scenarios might affect the availability of physical habitat for aquatic organisms within the Te Arai and Waipaoa Rivers.

5.1 Minimum Annual Low Flows (MALF) on Te Arai and Waipaoa rivers

There has been detailed work completed looking at all the hydrology records held by the Council, to make sure that all the river level data is accurate. The review identified that rather than MALF being 2,000 L/s for the Waipaoa River, it is in fact 2,550L/s.

A similar review has been undertaken for the hydrology records for Te Arai River. These confirm that the MALF is 60 L/s at Pykes Weir.

There is a smaller amount of available flow records for the water supply intake on the Te Arai River. NIWA have identified that the MALF for Te Arai River at the water supply intake is 38 litres per second – given the small amount of data available the level of accuracy is not as good as other assessment and is an estimate.

5.2 What minimum flows would support in stream values in Te Arai and Waipaoa rivers?

In the latest NIWA report, three minimum flow management options were assessed for the lower Te Arai and Waipaoa rivers[10]:

- **Option 1** - Instream values
- **Option 2** - Observed mean annual low flow (observed MALF)
- **Option 3** - Status quo.

Based on the work done to date on values of the rivers, as well as the requirements of Te Mana o Te Wai, the status quo does not provide for a range of key values. The status quo was set with a focus on prioritising irrigation and drinking water reliability over other values, while supporting a moderate level of ecological health. Work completed in our Advisory Group hui on values and environmental outcomes, identifies other values such as ecosystem health, threatened species, mahinga kai, recreational and a range of cultural values need to be better provided for.

Option 1 - Instream values identified minimum flow options that support 'high' levels of NPS-FM 2020 values, including all aspects of ecosystem health, threatened species and physical habitat associated with mahinga kai. Option 1 is used as the point of reference for Options 2 and 3.

Options 2 - Observed MALF, identified minimum flow options which are based on the mean annual low flow which has been observed at each of the sites.

Option 3 - Status quo assesses how the current minimum flow limits compare to Option 1.

The assessment of Options 2 and 3 against Option 1 use a five-point scale relative to Option 1. Relative to 'high', the other four levels of value protection were 'moderate-high', 'moderate', 'moderate-low' and 'low'. The outcome of the assessments is shown in **Table 2** below.

Table 2: Outcome of assessments on minimum flows under 3 options.

	Option 3 (status quo)	Option 2 (Observed MALF)	Option 1 (instream values)
Waipaoa @ Kanakanaia	1,300 (moderate)	2,550 (moderate-high)	3,000 (high)
Te Arai @ Reays Bridge	60 (low-moderate)	60 (low-moderate)	150 (high)
			Option 1 (instream values; naturalised MALF default)
Te Arai @ Water Works			36 (high)

The results of this assessment show that the current minimum flow limits may only provide moderate protection of instream values. Option 2 is an improvement on the status quo for the Waipaoa River and Option 1 provides the greatest level of protection.

The key message to take from this work is that to give effect to the NPS-FM and Te Mana o te Wai, it is likely that the minimum flow levels for the Waipaoa River and Te Arai will need to be raised. Further work on developing options for the minimum flow limits will occur in future meetings.

Any increase in minimum flow levels will impact the reliability of water supply for existing water users. There may also be changes to allocation block limits, but again, this will be discussed in future meetings.

5.3 Groundwater modelling

The groundwater limits and targets within the current Waipaoa Catchment Plan were guided by the GNS Science report 'Groundwater of the Poverty Bay Flats' (2012).

More recently, a Groundwater Model (GWM) of the Poverty Bay Flats Aquifers has been prepared to help manage our degrading groundwater resources and its interactions with surface ecosystems.

The GWM process reviewed the long-term groundwater level monitoring data in the aquifers. The review indicated that both summer pumped groundwater levels and recovered winter peak levels are declining. A similar decline is seen in the Matokitoki Aquifer. However, the shallower Waipaoa Gravel, Te Hapara Sands and Shallow Fluvial aquifers showed stable groundwater level trends.

The declines in the Makauri Aquifer are due to historical increasing groundwater pumping over time, which reduces the ability for the system to reach equilibrium. In addition, analysis showed that the time required for groundwater levels to recover following drought is increasing. As the frequency and severity of droughts are predicted to worsen, it will take longer for the Makauri Aquifer to recover in the future.

The GWM findings can be summarised as:

- If we do nothing, the model predicts an additional ~3m decline in groundwater levels, which is a further 120% drawdown on current summer groundwater levels in the

Makauri aquifer. This would also increase saline intrusion from the coast and the west, degrading water quality further.

- The shallower aquifers would see minimal change in drawdown, however their connection to the river would cause a decrease in the Waipaoa River summer base flow as well as a predicted 20cm decline in the surface water levels at Te Maungarongo o Te Kooti Rikirangi Wetland, which may affect the wetland ecosystem.
- Hydraulic pressures in the Makauri Aquifer would be reduced and the aquifer would be susceptible to receiving potential contaminants from overlying aquifers.
- The model predicts a 15% reduction on annual human usage from each of the aquifers will stabilise the current aquifer decline and assist the recovery of groundwater levels during effects of climate change and droughts out to 2045.

The current Waipaoa Catchment Plan was prepared with the knowledge that the Makauri and Matokitoki aquifers are in decline which is why reduction targets were included. However, while the targets for 2020 were met, the 2025 reduction targets are still well above the actual use from the aquifer.

A key message from this work is that we need to cut actual use – **Table 3** below shows the average metered use between 2008-2021, compared with the cuts needed.

Table 3: Average metered use of groundwater and reduction per aquifer in the Waipaoa catchment area, between 2008 - 2021.

Aquifer	**Average Metered Use 2008-2021 (m^3/annum)**	**15% reduction/sustainable level (m^3/annum)**
Makauri	847,000	719,950
Matokitoki	62,000	52,700
Te Hapara Sands	103,000	87,550
Waipaoa Gravels	69,000	58,650
Shallow Fluvial Aquifer	107,000	90,950

The key message to take from this work is that to give effect to the NPS-FM and Te Mana o te Wai, changes to the current groundwater management framework will be necessary. These changes may also reduce the availability of water for existing groundwater users, impacting their reliability. Cuts to individual water permit allocations will be required.

While decisions on projects such as managed aquifer recharge and storage schemes sit outside of the Waipaoa Catchment Plan, a key role of the TRMP is how easy or hard it is to put such schemes in place. This will be discussed further in the Regional Freshwater Plan FWAG group.

6. Next steps

At the May 2024 hui we will start looking at the options for setting of minimum flows and allocation blocks – and also what are appropriate timeframes for their implementation.

Alongside the FWAG hui we will also be meeting with Councillors, our treaty partners, and members of the horticulture sector to get their input into this discussion and include their input in future reports to this group.

7. Homework for next hui

Both the NIWA and WGA scientific reports are available in the appendices of the Council **Report 24-24**[2] which can be found by following the link in the footnote or by viewing the March Council reports on the GDC website.

Scientists will be presenting on these two crucial pieces of scientific work during the hui. Please come prepared with your questions. Our goal is for everyone to leave the hui with a thorough understanding of this very important kaupapa.

[2] https://www.gdc.govt.nz/__data/assets/pdf_file/0018/74142/Agenda-Extraordinary-Council-20-March-2024.pdf

8. Appendix A – Glossary

Environmental flows (or minimum flows):

The National Policy Statement for Freshwater Management (NPS-FM 2020) refers to environmental flow which is not defined. The TRMP refers to minimum flow which is defined as "*the minimum level at which a freshwater objective may be set to provide for the associated national value*".

> *"The environmental flow is the flow rate in a river or stream used as a trigger to suspend most water abstraction. Some uses may continue on a restricted basis, but these are generally limited to meeting human health needs. The environmental flow is set to protect particular values, most commonly aquatic habitat to protect ecosystem health. The flow in a river or stream may naturally drop below the environmental flow following the restriction / suspension of consented abstractions."*

This definition is not particularly informative, instead a more simplistic meaning is set out below.

Environmental level

An environmental level is similar to an environmental flow but is typically applied to an aquifer or lake. It is a water level set below which water takes must cease or reduce. Again, an environmental level is set to manage particular values of the aquifer or lake.

Take limit

This is the maximum rate or volume of water that may be abstracted from a water source (river, stream or aquifer). The total allocation is available for water users to apply to take for abstractive uses.

Management flow

The management flow is the environmental flow plus the take limit. Once a river flow hits the management flow, water abstractors will likely need to begin to reduce their abstraction rates.

Residual flow

The residual flow is the amount of water that must be left in the river at the point where water is taken.

Mean Annual Low Flow (MALF)

The MALF is a statistic that describes the average amount of water in a river during times of low flow. It is calculated by averaging the lowest flow for each year across all recorded years.[16]

Freshwater Management Unit (FMU)

FMU is defined in the NPS-FM 2020 as "*means all or any part of a water body or water bodies, and their related catchments, that a regional council determines under clause 3.8 is an appropriate unit for freshwater management and accounting purposes.*