greater WELLINGTON
REGIONAL COUNCIL
Te Pane Matua Taiao

MEMO

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FOR YOUR INFORMATION

Defining Freshwater Management Units for the Ruamahanga River catchment

The National Policy Statement for Freshwater Management 2014 (NPS-FM) requires that regional councils subdivide their regions into Freshwater Management Units (FMUs). The NPS-FM defines an FMU as '*a body of water, multiple bodies of water, or any part of a water body determined by regional council as the appropriate scale for setting freshwater objectives and limits and for freshwater accounting and management purposes*.'

The Ruamāhanga Whaitua Committee (RWC) also require the Ruamahanga catchment to be subdivided into management units to enable both scenario model reporting and subsequent Committee recommendations to be made at appropriate spatial scales.

The Environmental Science Department was asked in July 2016 by the RWC project team to provide some advice on how a set of FMUs should be defined for water quality and quantity management in the Ruamahanga catchment. The advice is summarised here.

Scope

The setting of spatially variable objectives and limits has been occurring to some extent in the Wellington region for many years (e.g. minimum flows and allocation limits defined by catchment). More recently (June 2016), a biophysical approach to defining a framework for FMUs in the Ruamahanga catchment was developed for GWRC.

The scope of the Environmental Science Department brief was to consider both existing GWRC practice and the more recent FMU framework recommendations and give some pragmatic advice about how final FMUs should be defined to help meet various national and regional requirements.

Approach

This was a desktop exercise based primarily on consideration of the following:

- The Ruamāhanga Whaitua Committee held a workshop in 2014 to explore the concept of FMUs. They developed a preliminary conceptualisation of FMUs based on logical differences in river characteristics associated with differing topography, geology, climate and values. A map of the RWC conceptualisation is given in Appendix 1.

- A report from LWP (Ton Snelder and Caroline Fraser) in June 2016 titled *Defining a biophysical framework for Freshwater Management Units of the Ruamahanga Whaitua.* This report used the River Environment Classification (REC) as a basis for defining spatial units that discriminated between river and stream catchments of different biophysical type.

- GWRC has been managing surface and groundwater abstraction in the Ruamahanga catchment using a conjunctive management framework developed in 2011. This framework defines 14 discrete Groundwater Management Zones that incorporate (where relevant) connected river and stream environments.

- In 2015 GWRC, notified a Proposed Natural Resources Plan (PNRP). In the PNRP, watercourses and aquifers are grouped for the purposes of both establishing objectives and setting limits. In addition to the 14 Groundwater Management Zones mentioned above, 16 "Catchment Management Units" (some of which are nested) have been defined for setting allocation limits for surface water (and directly connected groundwater) and six "River Classes" have been defined based on the Freshwaters of New Zealand (FENZ) classification for setting water quality objectives.

We compared the spatial management units that have been developed through the various strands of work described above and considered what sort of merging and layering might be needed to meet the RWC and NPS-FM requirements. We paid particular attention to the questions of scale and groundwater connectivity, in both a quantity and quality sense, and how this might influence FMU boundaries.

Recommended FMU framework

The basis for the discrimination between spatial units in most of the strands of work described in the previous section is more or less the same; surface water catchments or river types aggregated according to dominant biophysical properties, mainly topography, climate and geology. The LWP (2016) report provides a sound rationale and justification for the catchment-based biophysical approach and it is therefore important that the final FMUs for the Ruamahanga catchment reflect this thinking.

An important consideration is individual FMU coverage and scale. Too many FMUs results in an overly complicated and onerous management framework. Too few FMUs leads to the risk of some sensitive fine scale environments being overlooked (in terms of both policies and monitoring and reporting). Suggestions that follow in this section are an attempt to reach an appropriate balance.

The FMU framework needs to allow for both of the following:

- Setting of management objectives and limits that recognise freshwater environments of similar type.

- Cumulative accounting of flows and contaminants in a downstream direction through the Ruamahanga parent catchment.

To meet these needs it is suggested that the framework comprise a set of building blocks that can be both merged into a set of units that represent common freshwater environment types as well as layered into a hierarchy of nested FMUs.

Table 1 summarises these building blocks and they are shown in Figures 1, 2 and 3 that follow.

Choices about which FMUs are most appropriate to use and how building blocks should be layered will depend upon the particular resource management question being addressed (e.g. quality or quantity limit setting, accounting for fluxes and flows etc.) It is not within the scope of this memo to advise further on the implementation/application of FMUs for particular purposes.

Table 1. Suggested FMUs

Type of FMU	Description	Rationale
FMUs defined by bio-physical criteria	Ten FMUs that broadly discriminate different climate (wet/dry), geology (hard/soft rock) and hydrology (hill fed, spring fed) drivers. See Figure 1	The FMUs discriminate between freshwater environments that have different climate/geological drivers, water quality characteristics and instream values and can be expected to respond in different ways to pressures. The FMUs remain largely consistent with: • the river classes used to define ecosystem health and recreational water water quality in the PNRP • the building blocks suggested by LWP (2016), and • the RWC conceptualisation of FMUs
FMUs defined by Ruamahanga sub-catchment boundaries	**Tier 1** A single FMU encompassing the whole Ruamahanga River catchment upstream of the mouth at Lake Onoke, including all connected groundwater management zones. See Figure 2	Allows total catchment mass balance accounting for quantity and quality.
	Tier 2 Five FMUs nested within the parent Ruamahanga catchment. • One representing each of the upper, middle and lower river (upstream of the Lake Wairarapa outlet) • One representing the surface water catchment that drains to Lake Wairarapa • One representing the bottom of the catchment that receives outflow from both Lake Wairarapa and Ruamahanga River and discharges (via Lake Onoke) to Palliser Bay. See Figure 2	These are units that allow for a finer scale of accounting than Tier 1 and discriminate between the main Ruamahanga catchment and the two lake systems (that have very different hydrological controls and regimes). The boundaries between the upper, middle and lower Ruamahanga FMUs represent pragmatic divisions of the parent catchment but are also defined by an alignment of surface and groundwater units.
	Tier 3 Nineteen FMUs of various sizes that represent individual surface water catchments (tributaries of the Ruamahanga River) See Figure 2 Fourteen FMUs representing Groundwater Management Zones See Figure 3	These are the units that are identified in the PNRP as having individual water quantity limits (both minimum flows and allocation limits) They are discrete surface water hydrological units or aquifer units defined by pragmatic hydrogeological boundaries. Most of the surface water FMUs have flow recorder sites.

Figure 1. FMUs defined primarily by bio-physical attributes

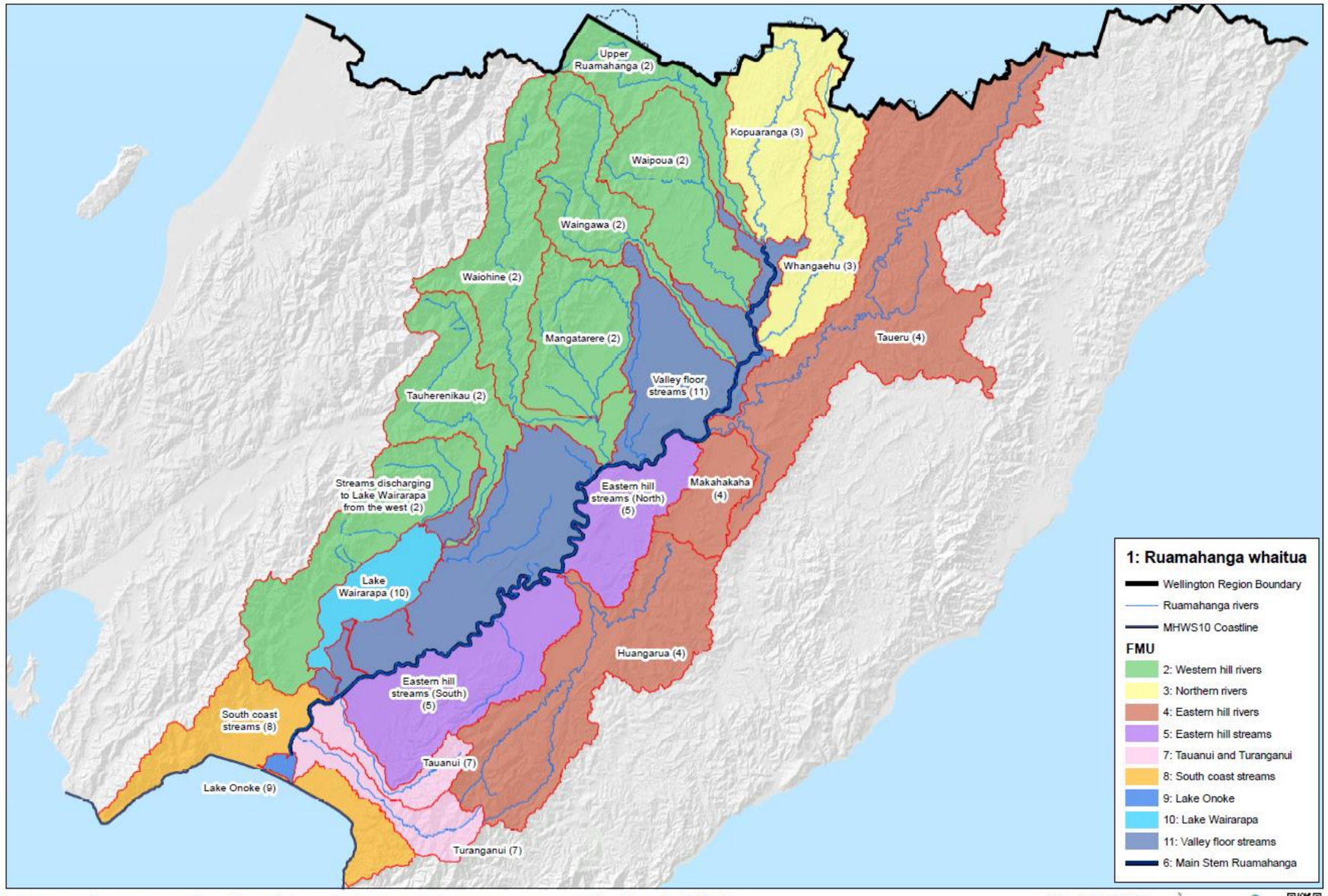


Figure 2. FMUs defined by Ruamahanga River catchment and sub-catchment boundaries; Tier 1, 2 and 3

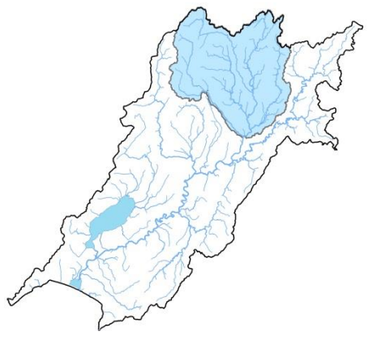
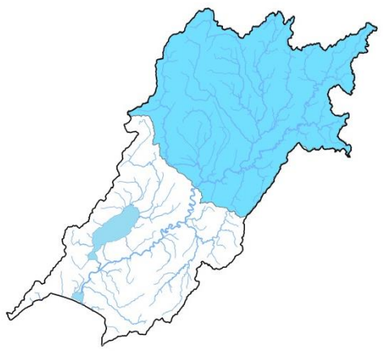
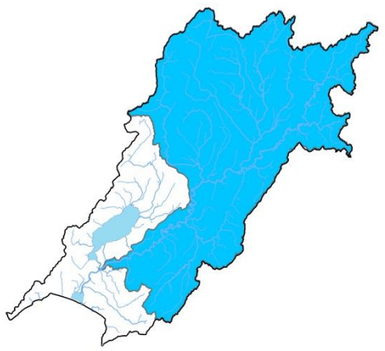
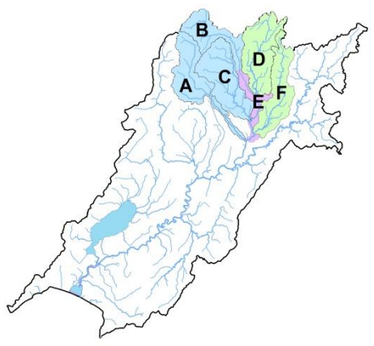
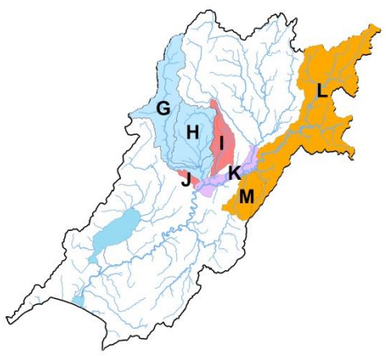
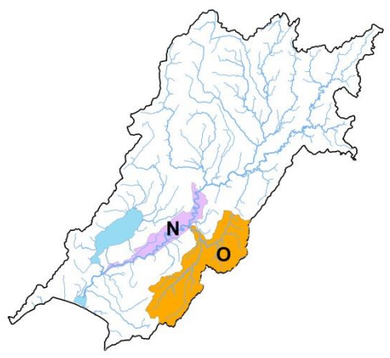
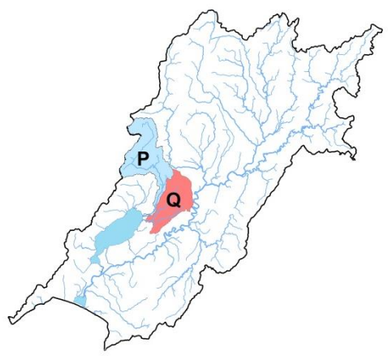
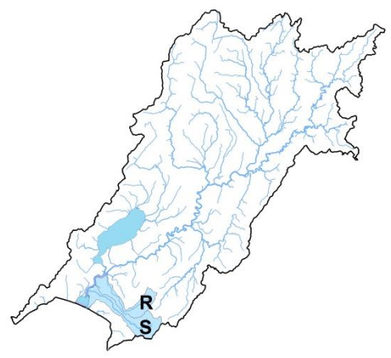
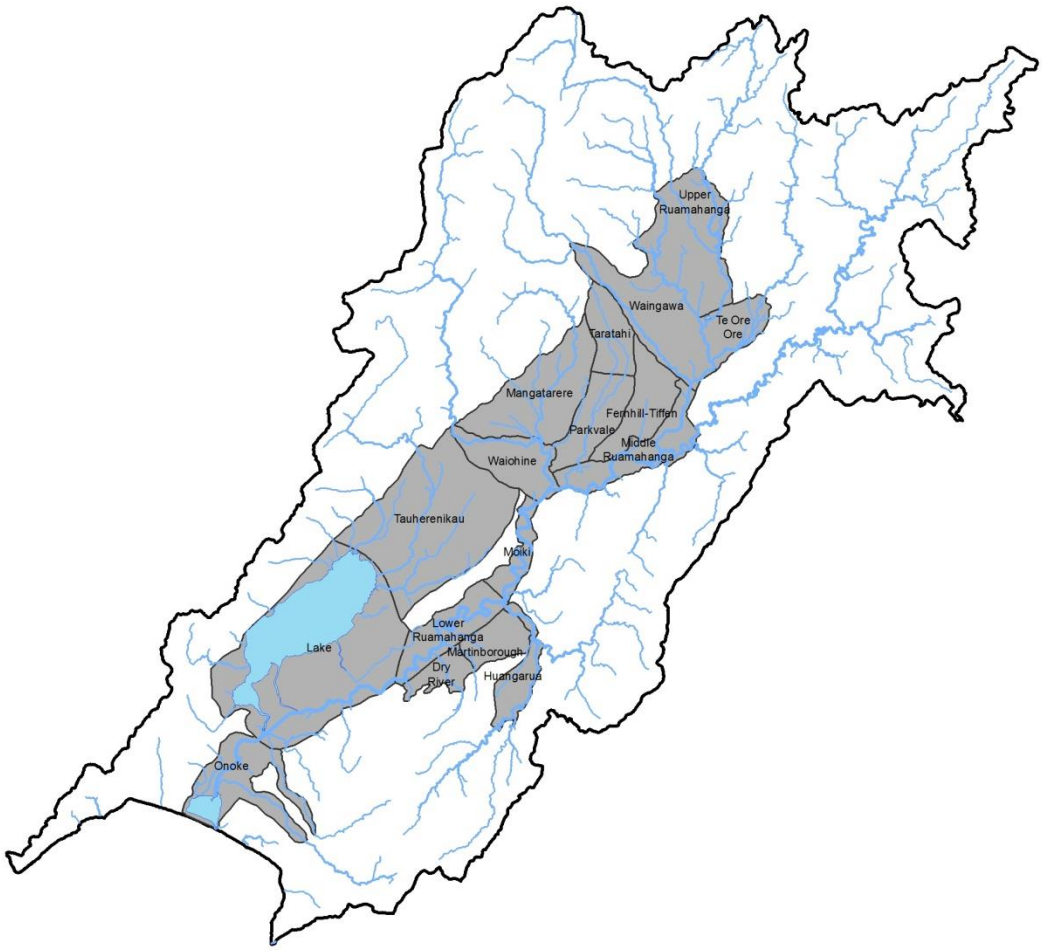
TIER1					
			Whole Ruamahanga catchment		
TIER 2					
	Upper Ruamahanga catchment	Middle Ruamahanga catchment	Lower Ruamahanga catchment	Lake Wairarapa catchment	Bottom of catchment (including Onoke)
TIER 3					
	A=Waingawa, B=Upper Ruamahanga, C=Waipoua, D=Kopuaranga, E=Main Stem Ruamahanga, F=Whangaehu	G=Waiohine, H=Mangatarere, I=Parkvale and Booths, J=Papawai, K=Main Stem Ruamahanga, L=Tauweru, M=Makahakaha	N=Main Stem Ruamahanga, O=Huangarua	P=Tauherenikau, Q=Otukura	R=Tauanui, S=Turanganui

Figure 3. Fourteen Tier 3 FMUs representing Groundwater Management Zones



Appendix 1. RWC conceptualisation of FMUs

The Ruamāhanga Whaitua Committee defined preliminary FMUs in a 2014 workshop, as shown in the following figure (presented as Figure 1 in the LWP 2016 report)