# Contents

# PART 2 - SUPPORTING INFORMATION

# Section A - Statutory **Framework**

The statutory framework for bvater allocation. and for the b\/langatarere cat&men: is as follows: the Resource IAanasement *Act 139 1,* the *Regioulal Policy Statement ,~?r the Wellington Region* and the *Regional Freshwater Planjbr ;he Wellinytov: Region.*

## A.1 Resource Management Act 199’1

The Resource -3lanagement Act 1991 (R?&i) provides a statuiory framework on which Regional Councils can base a water allocation plan. Section 30 of the hql-4 gives Regional Councils the function of being primary- water management agencies. They have the responsibility for controlling the allocation of water and the setting of flow regimes.

Section 13 (3 j outlines that a person may not take, use, dam or divert water unless such activities are permitted in a regional plan or by a resource consent’.

### A.1 .I Instream values

The RIM&q gives water managers a list of matters which must b’e considered when planning and allocating water. Section 5 (3)(b) of the ELMA explains ‘sustainable management’ as ma~qing *rhe use, development c$ . resources in a way, or at a rate, which enables people and communities to provide for their social, economic or cultural wellbeing . . . ..while... safeguarding the lfe-supporting capacity of air, water, soil. and ecosystems.* This, along with ~l~&ler principles in Sections *5-8* of Part II (along *with The Wafer Regime,* Vol l,A of the RMX); allow us to appreciate the potential range of values to be sustained, when marqing the use of water from the Mangatarere catchment.

The 3 main categories of instream value (in bold below), derive from the following terms within the F3&4: (Assessment of the statutory framev:ork and consultation can identify which of these are relevant to the Mangatarere. j

*Ecological values* .- life-supporting capacity of water and ecosystems (and soil and air), significant habitats of indigenous fauna, significant indigenous vegetation., intrinsic value of ecosystems, quality of the environment, protection of the habitat of trout and sa.lmon

***Landscape Values*** - natural character, legibility, aesthetic values, ephemeral values, spiritual values, popular values, outstanding natural features and landscape,s, amenity values, intrinsic values of ecosystems.

***Recreational Values*** - Includes amenity values and public access

*Maori Values* - relationship of Maori and their culture and traditions, as matters of national importance, regard to kaitiakitanga and the Treaty of Waitangi.

## A.2 Regional Policy Framework

Two policy documents for the Greater Wellington Region, address the issue of water allocation; the *Regional Policy Statement for the Wellington Region (RPS) xxi* the *Regional Freshwater Plan* **for** *the Wellingtou2 Region* (RFP).

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**’ Tile oniy exceptions to this are water for an mdlvlduals reasonable domestic needs, reasonable needs far ;n~ mdwduals ammal’s drinkmg water and firefi~htln~ needs.**

### A.2.1 Regional Policy Statement

The RF'S is an overview documerx which provides the framework for managing the resources of our re,gion in a sustainable was:. Chaprer 5 - *Freshw'atw* recogises conflicts in the allocaCon of water due to competing uses andvaiues i&sue 3) and that over allocation and the demands of sustainable management are presenting challenges to waler managemenr (Issue 4).

Relevant policies in Chapti-5 cover water quality and quantity issues:

| |
|---|
| *Polk;/ I and 2: To manage the quantiv, and n!aintain and protect (he quality offiesh wuler so that it is uvuilablefov CI yange of uses and values, and:* |
| *(I) ils life suAp~orting capacic; is sde~ucl-dea'; mz?* |
| *(3) its poterzlinl to m,zet the ve~soiiabl?;for,esee~~lle needs offzzrture generations is sustained; and* |
| *(3) ,foy syface water. aFly adverse ef+cts on uqucrtic ecosystems are avoided, remedied or mitigated.* |

Relevant methods include developing and applying flow regimes and safe yields based on instream habitat requirements and other factors (Methl,d 3) and preparing location specific plans to safeguard life supporting capacity, establish minimum flows and allocate safe yields of any water body which is under pressure from competing uses (Method 4).

### A.2.2 Regional Freshwater Plan

The RFP provides $ecific policy guidance and rules for water quantity and quality. It provides guidance on which rivers in the region shcluld be managed for which purpose (for instance, for water supply or contact recreation). There are several policies in the RFP that give specific guidance for the management of the water resource in the Mangatarere catchment, which are as follows

1. Establishing hl.inimum Flows And Approaches To Water Allocation **(Man:atarere catchment)**

   *Method 8.3.3 Where practicable, obtain more information to establish desirable nzinimunz Jaws and approaches to water allocation such as those used in Policy 6.2. I[2] for the following water bodies where there is potential for water shortage:: to occu7~*

2. Avoiding Effects On Trout Habitat And Managing Water Quality For Trout Fishery ,4nd Fish **Spawning PUrpOSeS (Mangatarere Stream, Kaipatayata Stream' and Beef Creek)**

2 Relates to minimum flows and water allocation

'This relates to downstream ofbe dam Pol~c)i 52.5 (to manage *ate: quality forwater supply purposes) applies upstream ofthe dam.

*Policy 43.14 To mc)id. weedy or n!it!gaie anv adverse e,fl>c~ on impormnt zrou~ habitat in the hgion, ia'ent$ed iii Appendix i* ('includes the Mangatarere River from S27 158 240 to its confluence with the Waiohine River at S26 199 13 i , the Kaipatangata Stream, from the water supply dam downstream at S36 1502 I 1 to its confluence with the Mangatarere at S26 i 96 15-t) and to Beef Creek (above iis confluence with the Waiohine at S26 199 1351 by:

Q *.,Cfunaging :wter qualily so that Policy .i, 2. j is sutisjied; and*

b *A4unnging the j'lo~js and ievels of water bodies so that policies 6.2.1, 6.3.2, 6.2.12, and 6.2.133, whichever is (are) relevant, is (are) satl$ed; and*

- *Huving yari'icztlar r*egcri-d to offsetting cdver-se efects on trout habitat; and*

* *Having pari'iculai- regard to maintainin: the same, or similar-, river bed conjjiguration in the rivei-s ident$ed.*

*Policy 52.3 To manage water quality fop ti*out$sher.y and&h spawning purposes in those rivers, or parts of rivers, identlj?ed in Appendix 4 (su/gecl to Policy j.2.10)*

3. Needing Enhancement Of Water Quality Fc:r Aquatic Ecosystem Purposes **(Mangatarere Stresm')**

*Policy 5.2.9 To manage the quality of the fresh water of the rivers, or pavts of yivers, idenrijied in .-lppendh* 7 (Water Bodies With Water Quality Identified As Needing Enhancement) *so that water qualiv is enhanced to satisJSi the pur-poJes identiJied in the Appendix (subject to Policy 5.2. IO) Appendh* 7 includes the 1Man~atarere Stre.im - both above and blelow the oxidation pond discharge from S26 199 131 to S26 234 214 (this spans from confluence to just north of .4ndersons Line) and states it is for aquatic ecosystem purposes

Minimum flow is described in the EWP as follows:

*2%~ mininmm~low is a guide that yrovides an indication offlows i,rl the stream ihat will:*

- *Safeguard the life-supporting capacity qj'ecosystems,*
- *,Meet the needs offiture generations; ant71*
- *Provide for adequate water qua/i@.*

*Under most ciruvzstances, the jlou:s in lhe stream should not fall below the minimum jlow. However, in low jlow conditions, sl;i-eanzs may dccasionally drop below the minimum ~70~1s even iJ no water is abstracted.*

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*** relates to minimum flows and water allocation**

**' from the confluence with the Watohine to nort!l of .Andersons L1r.c**

The RFP also inclmks the followil:g guidailce pertaining to gene&l water allocation processes, nhich 'nave been taken into accomt during ti1.s water allocai!on process:

Policy 4.2.29 *To recognise the needs of existing lawful users of fresh water by:*

- *Allowing existing users to upgrade progressively their environmental performance values where improvements are needed to meet the provisions of the Plan; and/or*
- *Giving prior@ to existing users eve? new users at localions where the demand jbr the use of water is g~eule~ than that resource can sustain'.*

Poiicy *4.2.; 1 To ensure that the pr~occsscs jar* **mzki17g** *decisions i-elating to the management ofj?cshwatcr-* **is** *&ii- and ransparent. in parrictriau. to ensure lh,zt as@r as praclicabie,* **all** *interested people and ~comnzunities have ti;e opportunil;v* IO *be involved in lhej%+water Yesource mana~emerztprocesses, rncludifzg si,g+cani yesource consents.*

*Policy 6.2.2 To manage thejlows in rivers and streams not identiJied in Policy 6.2.1 blj having regard to .*

- *The si,gniJicance of rxztzrval, amenity, arz,d tangatn whenua values; and*
- *The scaleinzagnitude ofany adverse eV$2cts on natural, amenity and tangata whenua values; and*
- *The i-eversibilin, of any adverse effects on natural, amenity and tangata whenua values*

*,Ir/ethod 8.1.3 Liaise with tangata whenua over- tiater resource issues iu;! the Region, including water qualip and quantity, and the\use of river and lake beds,*

b

# Section $3 - Summary of 200~ Consultation

Summary of Consultation 2001

| Organisation | Main Value of Stream | Comments |
|---|---|---|
| Carterton District Council | Out-of-Stream + Recreation | • Wish to maintain takes for public water supply (Kaipaitangata), the Carrington water race and keep options open for further takes<br>• Popular for swimming, fishing, eeling and canoeing |
| Department of Conservation | Ecology | • Headwaters relatively unmodified with significant ecological values/habitats for native fish (mudfish and dwarf galaxias) - recognise this<br>• Minimum flows should provide for instream values<br>• To avoid water pollution during low flow, new discharge applications to be refused and existing discharges suspended for the period<br>• Holistic approach including riparian management and advocacy of efficient water use and water storage |
| Consent holders/ farmers /local residents | Out-of-Stream + Recreation + Ecology | • Economic value of water resource<br>• Recreation including swimming, picnicking (Belvedere Rd bridge), trout and eel fishing; Swimming not possible when dry in parts<br>• Minimum flow to protect water quality and recommend riparian management<br>• Protection of ecological values should be balanced against landowner rights, flooding risk and financial benefits of irrigation<br>• Discharges and takes to be controlled to support high level of water quality<br>• Some thought water quality was improving whilst others thought quality lower in summer when flow low and stock have access |
| Rangitaane o Wairarapa | hlaur1 + I<:cology | • Improve water quality, quantity and the instream habitat for indigenous flora and fauna<br>• Concern over mixing with water from other catchments, landfill leachate, sewage discharge<br>• 'Healthy rivers - healthy people' and encouragement of riparian management |
| Forest and Bird | Ecology | • Minimise water takes – use alternative sources and encourage efficient water use<br>• Recreational use important although must not affect water quality adversely<br>• Water races can be beneficial in ecological terms<br>• Encourage riparian planting, discourage stock access to stream, improve landuse practise, to lessen impact on ecology<br>• Concern over effect of discharges |
| Fish and Game | Recreation (fishing) | • Important spawning/recruitment habitat, locally significant brown trout fishery; low flows effect habitat for fish<br>• Minimum flow must be determined using ecologically sound methods – concerned WAIORA inappropriate<br>• Provide for instream values; habitat for fish and macroinvertebrates, recreation and realistic needs of out-of-stream users<br>• Recommend riparian enhancement as quality affected by landuse – dairying, stock damage, runoff<br>• Advocate efficient water use and storage |
| Fish and Game Association, Wairarapa | Recreation (fishing) + Ecology | • Major trout spawning river and significant fishery<br>• Quality and quantity must support existing flora and fauna year round to maintain fishery<br>• No impediments to fish passage |

# Section C- Flow Regime Options Prop&d in Draft Wan

As part of consu!tation in October 2003, several flow regime options were put forward for consideration. Two options for each reach c~:ere proposed.

Feedback indicated the options involving a stepdown or additional trigger flow were preferred. Tlnerefore this final plan has chosen Upper Rzach Option 3 Tdnd Lo-tier Reach Option 1. Below is a s:~llir,ary of the opt:ons, as they were presentc:d for consideration at the draft stage.

## Upper Reach

Lipper Reach Options 1 and 2 do not all,,w any further water allocation above the existing consented level.

- Option 1 requires all takes to cease when the flow in the stream falls below 125 l/s.
- Option 2 uses an additional trigger flow whereby takes are restricted to 50% when the stream falls below 160 lis, and are then suspended completely when the flow falls below 125 Us.

## Lower Reach

- Option 1 has a similar approach to Upper Reach Option 2, where all takes are restricted to 50% when the strearn falls below 125 l/s, and then suspended completely when the flow falls below 90 l/s. This Option does not allow any fk-ther allocation from this Reach.
- Option 2 does allow further allocation 01'50 l/s. However, all takes are suspended completely when the stream falls below 125 l/s.

Summary of Proposed Flow Regime Options

| Reach | Minimum Flow at Which All Takes Will Be Restricted to 50% | Minimum Flow at Which All Takes Will Cease | Core Allocation - Amount of Water Which Can be Taken Above the Minimum Flow |
|---|---|---|---|
| Upper - Option 1 | None | 125 l/s | To be set at the existing quantity of consented water allocation |
| Upper - Option 2 | 160 lis | 125 l/s | As above |
| | | | |
| !,ower - Option 1 | 135 l/s | 90 l/s | As above |
| Lower - Option 2 | None | 125 l/s | A further 50 l/s in addition to the existing consented quantity |

# Section D - Water Quality and Ecology

## D. 1 Background

Since 1997 regular water aualitv and ecologi'zal monitoring has been carried out ir, the LJangatarere Stream at the SK bridge iPart- 1, Figure 1'), as part of the State of the Environment (SOE) Rivers 3Aonitoring Programme. Regular monitoring is also carried out up and downstream of the discharge from the Carterton oxidation ponds."

Data from the SOE, monitoring in the Lowc,r Reach of the MAngatarers cat&n-rent indicates that water quality and ecological health of this stream has declined significantly since 1997 and that the stream is currently moderately, polluted. The most prominent trends include siginticant increases in plant available nutrient concentrations and significant declines in macroinvertebrate community health.

'*4 full copy* of *the Water Qualit;L, and Ecosystem Health of the Mangntarere River* report (Greater LVellington, 2002) can be obtained from Greater Wellington Regional Council.

Please refer to Section H Glossary for all terms.

## D. 2 Physical Water Quality

Water temperatures' in the bkngatarere at the SH2 bridge have been recorded at up to 17.2'C and may frequently exceed 20°C, the temperature at which sensitive macroinvertebrate species such as may-flies and stonefhks are adversely effectec1[8]. In general, spawning of trout and native fish species is adversely affected by temperatures exceeding 25'C, although feeding may reduce at lower temperatures.

The Mangatarere shows significant seasonal ipatterns in water clarity and turbidity (again monitored at the SH2 bridge). The water is clearest ar,d least turbid during the summer and least clear and most turbid during winter. This seasonal variation is strongly correlated to cat&n-rent runoff.

The following nutrient levels were found for ;he Mangatarere, relative to the recommended levels in the *Australian And Yew Zealand Guidelines :To'or Fresh And Marine Water Quality*[9]*:*

- The median dksolved oxygen (DO) level is 94.9% of saturation compared to the minimum trigger level of 98% of saturation". The instream flora and fauna health and hence life-supporting capacity becomes adversely e0Zected as DO levels reduce below 98%;

- The median level of Dissolved Reactive Phosphorus (DRP) is almost 10 times greater than the recommended maximum level of 1 Omgim';

- The median nitrate level is 3.5 times higher than the recommended maximum level of 444 mg/m'; and

- The median ammonia level is approximately 4 times the level for lowland rivers" of 21mg/m$^3$.

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[6] Effluent from these oxldaticln ponds is dlscharsed into the Mangalarere at a point approximately 2km upstream of the Waiohine confluence,Figure 1
' monthly spot readmgs
' Quinn & Hick-y, 1990
' ANZECC, 2000
" For sl~~hily dlsturbed aquatic ecosystems

## D. 3 Microbiological Water Quality

The Mangatarere Stream shows no seasonal patterns in faecal coliform concentration. Levels have decreased significantly since 1997 at an #average rate of 53,'10Oml/yr. ?, large proportion of this decline appears to have occurred since 1999 This corresponds uith the installation of mechanical aerators in the Carterton oxidation ponds. Ki:r, esceedances of the ANZECC *2000 Esche:-ichia coli* guidelines for safe recreational use have been recorded to date.

## D. 4 Ecology

Algal biomass accrual in the Mangatarere is limited for most of the year by frequent freshes. Despite high nutrient concentrations and ion:: accrual periods during summer, cover of periphyton filaments and mats at SW rarely exceeds 3O?b of the streambed.

Macroinvertebrate Community Index (MCI) and Semi-Quantitative Macroinvertebrate Community Index (SQMCI) values for the Mangatarere have declined from indicating "good water quality" in 1997, to "possible mild pollution" in 199%1999 and "possible moderate pollution" in 2000-200 1.

This decline in MCI scores reflects a number of changes in the macroinvertebrate community including a decline in the number of Ephemeropteran (mayfly), Plecopteran (stonefly) and Trichopteran (caddistly) taxa (known as EP'T taxa). EPT taxa, particularly mayflies, are considered to be sensitive to organic pollution. There ha:, also been a considerable increase in the abundance of taxa that are tolerant of organic pollution since 1997. The abundance of these taxa in stony streams is considered indicative of environmental stress.

Brown trout and eels are common along the length of the Mangatarere Stream. Some inanga have been caught near the SH2 bridge, while bullies have been found in the Upper Reach and specifically at the Mangatarere Valley Road bridge". NIWA reported the presence of torrentfish *(~Cheimavichthys* jkteri) and upland bully *(Gohiomorphus* breviceps) in the upper reaches of the h4angatarere in 198 1".

The Upper Reach cf the Mangatarere is an important trout spawning area and is popular amongst anglers during the early part of the fishing season. Fish numbers have been reported to decrease later in the summer due to low flows and high temperatures'".

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" 'The iowland River Environrnentai Classificaaon was selected bec!.use the area below the Gorge !jlte meets the criteria for this category

" 'Xeiiington Acclimadsation Society, 1988

" NZFWFD

I[d] Welilngon Acilmiatisatioil Society, 1998

# Section E - Low Flow Hydrology

## E.1 Background

-4 fuli copy of the ild~ngafai-wz Low *Flow H,vdrology* report (Greater Wellington, 2002) can be obtained from Greater Vv~ellington Regional Izouncil.

### E.l.l Catchment Area and Rainfall

The Mangatarere catchment is described in Figure 1> Part 1. It is approximately 160 km’ in area. Most of the water in the Mangatarere is derived from the Tararua Ranges. Annual rainfall in the main Tararua Ranses varies between 3000 and 7000mm. The average annual rainfall in the foothills of the catchment is: approximately 2900mm. In the open farmland, the annual rainfall is 2100mm (at Phelps).

### E.1.2 Flow Information Available

.4 continuous flow-recording site was established in 1998, in what is now the Mangatarere Gorge Environmental Monitoring Site (referred to as the ‘Gorge site’) (Figure 1, Part 1). A number of flow gauging for the last 30 years are available to compliment the relatively short continuous flow record.

## E.2 Low Flow Statistics

A synthetic flow reckrd for the Mangatarere was constructed in 1996. ‘iu’o continuous flow or stage record existed for the Mangatarere Stream prior to this. The synthetic record was constructed by correlating flows recorded on the Atiwhakatu Stream, north of the Mangatarere catchment, with actual flows gauged on the Mangatarere at the Gorge site”.

This synthetic record has been used to derive low flow statistics for the Mangatarere Stream. Therefore the results given are approximations only.

### E.2.1 Flow Distribution

Flow-duration curves show the percentage of time a river equals or exceeds a particular flow. Table El provides flow duration data for the synthetic Mangatarere flow record at the Gorge Site.

iTable El: Flow-Duration Data At the Gorge Site (Synthetic Mangatarere at the Gorge Site, 1976 - 1995, l/s)

| yil | 0 | 1 | 2 | b | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| 40 | 1338 | 1296 | 1259 | 1222 | 1189 | 1154 | 1121 | lOS5 | 1051 | 1016 |
| 50 | 983 | 949 | 917 | 886 | S56 | 828 | 801 | 775 | 755 | 733 |
| 160 | 710 | 696 | 674 | 655 | 638 | 618 | 603 | 596 | 570’ | 554 |
| 70 | 541 | 527 | 510 | 495 | 480 | 467 | 353 | 439 | 427 | 413 |
| 80 | 399 | 386 | 373 | 360 | 346 | 333 | 320 | 306 | 191 | 277 |
| 90 | 262 | 249 | 234 | 221 | 206 | 197 | lS3 | 166 | 148 | 127 |
| 100 | 61 | - | - | - | - | - | | | | |

“ R&m, G 1996: Mangatarere Water Resource -A flow correlation wth the Atwlxkxu

The example in boid shows that flows at the Mangatarere at the Gorge site are above 467 l/s for 75% of the time, and above 696 l/s for 61% of the time.
From this table, it is also possible to calculate the number of days on average that the flow is below a certain level. For the example used above, the flow on average, is below 467 l/s, for 365 * (1 – 0.75) = 91.25 days.

### E.2.2 Frequency Analysis

FrquencY analysi: is used to determine ihe statistical significance of an exireme low flow occurring. It tzlls us how ofien, on a\.erage, we can expect a particular low flow to occur.

Low flow freq;xnc,y figures were calculated using the com;uter package EV.4N'[6]. Table E2 summarises the resuits.

Table E2. Low Flow Frequency Analvsis For Svnthetic Mancatarere .4t the Gorge Site (l/s)

| Return Period (Yrs) | 1 day | 7 day | 14 day | 18 day |
|---|---|---|---|---|
| MALF | 168 | - | - | |
| 2.33 | 138 | 161 | 201 | 283 |
| 3 | 109 | 127 | 154 | 205 |
| 10 | 93 | 108 | 127 | 163 |
| 20 | 81 | 94 | 108 | 131 |
| 100 | 62 | 70 | 77 | 80 |

Period analysed 30"' Septelnber i977 to 3 1" Dec::mkBer 1995. The example in boic! shows that a flow (averaged over one day) of 93 l/s should occur, on average, every 10 years, or that a flow (averaged over fourteen days) of 154 ii's should occur. on zverage, everv 5 vears.

### E.2.3 Concurrent River Flows

To determine the relative volumes and locations of the inputs and losses to the Mangatarere system, a set of concurrent gauging have been corxlucted on the Mangatarere over the last lo-15 years, during the low flow season. These are summarised on Table E3 and presented on Figure El. Figure E2 shows the results from the **1997** ru:.l".

Table E3iFigure El show significant flow gains on the Mangatarere Stream during low flows periods overall, between the Gorge site and SN2. Large gains from the tributaries and recharge from the groundwater, cause these increased :ilows.

The reduction in flow between the Gorge Site and Anderson's Line (recorded during the 2003 gauging season, Figure 3 in Part 1) could be attributed in part to the take for the Carrington water raceI*. During the 200:I gauging season it mas confirmed that the Mangatarere frequently runs dry for some distance between r2nderson's Line and Belvedere Road bridge, prior to this only an anecdoral record was available. This may rizlate to seasonal groundwater levels, which affect the flow in the Mangatarere Stream. In late summer, when groundwater leve!s are lower, more water is likely to be transferred from surface to groundwater systems. This results in reduced stream flows, particularly in areas where the underlying gravels a.re deepest.

.A large increase in flow was noted between Dalefield Road and SH2.

[16] Event Analysis
" Undertsiten on 70 May 197
"occurs below the bfaqatarx Gorge Environmental Monltorni= :#lte, Figure Cl

Table E3 Concurrent Flow Gaugings (l/s) On The Mlangatarere Stream 19751,003

| Date | Gorge Site | Mangatarere Valley Road | Andersons Line | Belvedere Road Bridge | Brooklyn Road | Dalefield Road | SH2 | Confluence with Waiohine | Comments |
|---|---|---|---|---|---|---|---|---|---|
| 7/2/73 | 61 | - | - | 38 | - | - | - | - | - |
| 8/2/79 | 140 | 143 | - | 25 | - | 81 | 290 | 422 | - |
| 28/1/85 | 114 | 252 | - | 43 | - | 43 | 57 | 253 | - |
| 18/1/93 | - | - | - | 672 | - | 1018 | - | - | - |
| 4/2/93 | - | - | - | 978 | - | 1417 | - | - | |
| x:1/97 | 756 | SO? | 829 | 1057 | 1003 | 1551 | 2176 | - | No irrigallon. 21 l/s take for CIX* water race |
| 2Ofi97 | 348 | 211 | 229 | 253 | 294 | | | | No mqtion. 67 l/s take for CIX water race |
| 21/3iOO | 469 | i - | - | 270 | - | - | | | |
| 28/2:01 | 167 | / - | - | 71 | - | | | | |
| 5i301 | 2 1 | j . | - | 72 | - | | | | |
| bi3iO3 | 268 | / | 150 | 165 | - | 234 | 515 | - | - |
| 1 J/383 | 321 | | 226 | 278 | - | 303 / | 628 1 | - | 1 - |
| 31!3/03 | 220 | | 73 | 77 | - | 127 | 348 | - | |
| 2,/3;03 | 197 | - | 20 | 50 | - | 70 | 273 | - | 156 lis take for CDC w/r |
| 114103 | 325 | | 214 | 243 | - | '90 | 514 | - | |
| 10/4/03 | 230 | - | 103 | 115 | - | 164 | 425 | - | 135 i/s take for CDC w/r |
| Average | 266 | 356 | 230 | 275 | 649 | 382 | 589 | 33x | |

Figure El Concurrent Flows Gauging (l/s) on the Mangatarere Stream 2003

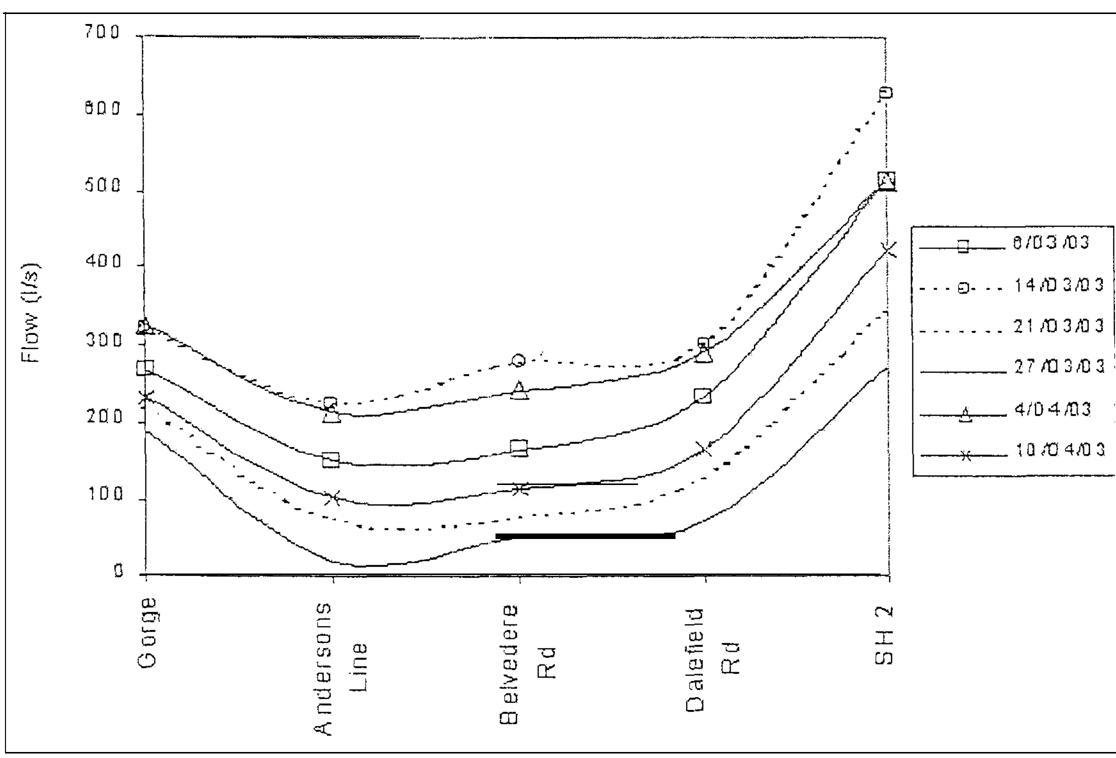
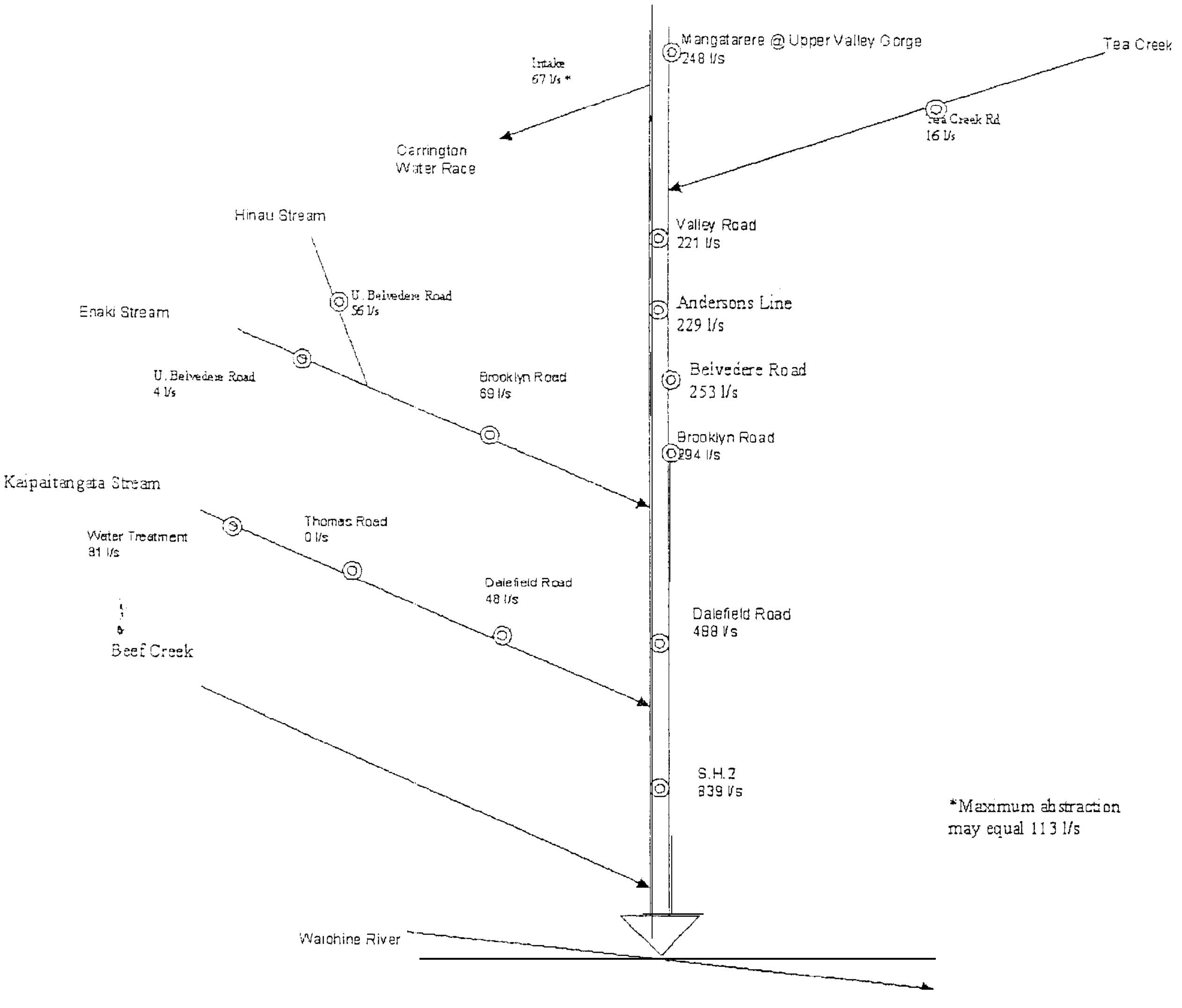


**Figure E2 Mangatarere Catchment - Inputs & Losses (1997)**



# Sectisn F - Low Flow Msdelhg

## F.1 IFltVl & WAIORA

A number of models are available that can be used to establish minimum flows to support the Instream Management Objective (EvlO). T~iio modeis that were used on the Mangatarere were:

- IFIM (Instream Flow Incremental Method); and
- WAIORA (Water Allocation Impacts OTI River Attributes).

Both give guidance on establishing minimum flow requirements using habitat modelling, but use slightly different approaches.

IFlZW is nationally recognised as a robust method of determining instream habitat requirements. It uses descriptions of the prefened habitats of fish and invertebrates and hvdraulic modelling of river flow to predict changes in available instream habitat with changes in flow. It uses habitat suitability curves to describe relative habitat quality, r,mging from zero (unsuitable) to one (optimum).

WAIQU is still in its development staE;e. However, it has potential to be a valuable tool in tracking changes in instream habitat requirements based on various abstraction levels, and introduces more e&iromnental variables in making its assessment.

It is undergoing further calibration and development by NIWA and may be used in low flow management of the Mangatarere and othzr Wairarapa streams in the future. However it is not considered robust enough yet, for use in streams outside the Auckland region where it was developed.

,4s IFIM is not generally considered suitable for small streams, it is useful to be able to compare values derived from both models, and therefore both were used in investigating instream habitat. Similar values were produced by both models.

IFIM was however chosen as the appropriate tool for detemlining flow regime options for the lMangatarere, as W;,4IOR4 is still in its early stages.[19] In addition, IFIM is based on fish and aquatic invertebrate habitat and as identified in Section 3, the IMO relates to trout habitat and aquatic ecosystem. IFIM also recommended slightly more consenative minimum flows than W,4IOR4 did, which ensures greater protection for the IMO.

In summary, both IFIM and WAIORA showed the Upper Reach has the highest minimum flow requirements for instream habitat. The existing allocation level in this Reach may be too high, whilst the Lower Reach could potentially support further allocation without compromising those requirements.

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[19] Furthermore, consultation showed Wellington Fish and Game Council had concerns over the use of WAIORA

P, full copy of the fdiowing reports (all Greater Wellington, 3002) can be obtained from Greater W'eliington Regional Council: *~m~arn Habitat .4ssessment ,fY~r the L'dangatarere River, ItWORA Reportj'bu ~\kingumwe River ad kEdiC>&d lii?~ses I~Ih~,ocoi- the l\/(un,gatarere River.*

## F.2 The '213s' Rule

IFIM does not define a minimum flow ir. litres per second, or the amount of habitat loss that is acceptable. It only provides information on chan;0s in habiaat at different flows. To determine a suitable minimum flow, a decision mustjirst be made regarding the minimum amount of habitat that must be maintained, or the amount of habit.at loss that is acceptable. Rules of thumb frequently used to do this include retainin, 23s of the habitat (whether it be for fish, insects or food producing habitat) at UALF, or aiternatively 30% of the Weighted Useable ,4rea(WUA)".

To the best of current 'knowledge, the Y3s Rule has been adopted in this plan to satisfy the principal issues relating to water allocation in the catchment. However. there is some concern over its use[11]. Whilst we acknowledge it is an arbitrary value, there is no methodology available at the moment to select an alternative proportion of bL4LF.

A4s mentioned in Part 1 Section 1.6, revision of the WAP may be considered, as other studies become available. Such studies currently taking place, involving the Mangatarere, include the WA4IOR.A study, the MtE Low Flow Study and the bl'assey University Low Flotv Study. The outcome of this work may provide more opportunity to consider whether an alternative to the 23s rule is appropriate!

It has been suggested that for smaller rivers, the minimum flow be based on a minimum amount of habitat equivalent to that exceeded by 85'!/0 of the national survey rivers at their mean annual low flow, rather than using the 3'3s rule"'. However, although the tifangatarere Stream is a small stream, this guideline was not used for this plan."

## F.3 IFIIVI Methodology

During autumn 2002, an IFIM study was carried out on selected reaches of the Mangatarere river between the Gorge site and the confluence with Beef Creek. The purpose was to determine the actual habitat suitability over a range of flows for fish species and the food producing habitat, and to deduce at what minimum flows, fish habitat is protected without restricting water use too much. Analysis of the different life cycle of brown trout habitat, food producing habitat, longfin and shonfin eels, upland bullies, torrentfish and inanga were modelled.

Each cross section profile was surveyed, vvater velocities measured, and visual estimates made of the substrate composition. Flow and water level measurements were made to establish a relationship between flow and water level. The IFIM model was then used to predict water level, velocity and habitat suitability at other flovvs.

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[20] These rules of thumb were originally put forward in Jowett, 1993.
[21] *Flow Guidelines for Instream Values*, MfE 1998, Section 12.3.3
[22] Jowett I.G. 1993: *Minimum Flow Assessments for Instream Habitat in Wellington Rivers*. NIWA, June 1993.
[23] This is discussed in *Instream Habitat Assessment for the Mangatarere River* (Wellington Regional Council, 2002)

A habitat preference curve was ?roduceci, for each fish species. All species habitat curves declined towards zero as flow diminished. 11 was found that the optimum flow varies significantly: with the species being considered and That generaliy, the flow requirements were greatest in the Upper Reach and least in the Lower Reach. It also fouillj that relationships between habitat and flow showed food producing and adult brown trout habita:s optimum flow tvere the highest amongst all species examined.

1

## F.4 Habitat Modelling and Minimum Flows

IFIM's habitat suitability curves are expected to give the most accurate information upon which to make minimum flow decisions. They indicate that habitat availability declines towards zero once flows drop below MALF. Therefore, Cec;sions on appropriate minimum flows are based on flows that maintain an acceptable percentage of the habitat available at MALF, which as mentioned above, is proposed to be Xs in this plan.

As the relationship between habitat and flow showed food producing and adult brown trout habitats optimum flow were the highest amonggst all species examined, the minimum flows for the !Mangatarere Stream have been based on retaining 23s of rhe food producing habitat at MZ4LF'" (Table Fl). As a consequence of using this basis, other species and their food sources are provided for.

Table Fl Habitat yodelling at NIALF using IFIM

| / Where | IM-4LF (I/s) | Width (m) | Depth (m) | Velocity (m/s) | Minimum Flow (L's) |
|---|---|---|---|---|---|
| Gorge Site | 16s | 8.492 | 0.206 | 0.101 | 129" |
| 1 Belvedere Rd Bridge i | 150 | 6.908 | 0.145 | 0.163 | 1 p |
| SH2 | 557 | 9.703 | 0.198 | 0.290 | 380 |

The IFIM and habitat methods have beer, used to derive the above minimurn flow values that can maintain enough habitat for brown trout. native species and their food source. These minimum *flows* will protect the IMO while still allowing some out-of-stream water use, as outlined in Part 1 Section 4.

*4 3ased on the findings of tie 100 Rivers St&y (Bi ggs. et at. I 9%). Rivers whose natural flows provided exceltnt trout habitat had more than 60% of their area provrding 'rood and space' ihabmt for adult brown trout. By ensuring that 7/3 (or 66%) of the WLA that is available at MALF is available at the minlmtim flow adeqme habltat should be provided for tiout while still allowmg some water abstradlon (Jowett, 1993).

25 a flow of 0.129 l/s or less occurs 1 ?k of the time at the Gorge-0 093 i/r is lowest flow on record

25 This figure is rounded up to 125 for the flow regune options in Part 1 Section 4.

# sectisn G - Current Pillscation

## G.1 **Upper Reach**

Table Cl Current:Requested Allocation for themer Reach

| Consent No. | Consent Holder | Location | Use | | |
|---|---|---|---|---|---|
| WAR 13 10201 | I C3C | / Ik&mgatarere srream | Carrington, Water race | 112 | Have appiied to increase to 200 I/s |
| WAR 0 10098 | McFadzcan | ' Well adjacent to .Clsn~atarere stream | Irrigation | 18.9 | No increase |
| WAR 0 10370 | Reid | / Bore adjacent to Ivlangatarere stream | Irrigation | 17.2 | No increase |
| WAR 000198 | Smith | ~ Well adjacent to Manilatarere stream | Irrigation | 26.5 | No increase |
| WAR010181 | Doull | Tail race of Carrington water race | Irrigation | 21.5 | No increase' |
| W-AR0020050 | CDC | Kaipaitangata Stream | Public water SLIDply | 80 | Current consent granted |
| W.4R 950155 | Fairbrother | Kaipaitangata Stream | Sub-surface irrigation | ? | Current consent Franted |
| WAR010193 | Hull | ) Enaki & Hinau Streams | Irritation | 8 | Take size reduced |
| WXR980187 | Smith | Beef Creek | Irrigation | 12 | Application pending |
| Total Existing Alloc&on | | 278.61/s for Upper Reach, 175.61/s for Mangatarere Stream alone | | | |
| Total Requested Allocation | | ~ 353.6iis for [loper Reach, 262.611s for Mangatarere Stream alone | | | |

' THIS xiivi[~ IS likely 10 be hovered under the Camngton water race co~wz~~t, hence it is InJt considered az part of the exmng allocaoon

Three of the allocations listed :in Table Gl are from wells/bores adjacent to the Mangatarere Stream. Given the proximity of these wells/bores to the stream (less than 50m) and that surface water flow is affected by groundwater in this area, these takes are classified as surface water takes under this plan.

Note that all consent? have 'espired and replacement consent applications have been lodged, but remain on hold until the proposed Plan Change process is complete, as mentioned in Part 1 Section 1.1.

In summary, the majority of existing consent holders wish to maintain their existing allocations. Carterton District Council has applied to increase their allocation for the Carrington water race from 113 l/s to 200 l/s (when the flow at the Gorge site is greater rhan 300 l/s).

## G.2 Lower Reach

Table G2 Current Allocation for the Lower Reach

| Consent No. | Consent Holder | Location | Use | Current Take Size (l/s) | Notes |
|---|---|---|---|---|---|
| W~4ROlO210 | Hodder | Mangatarere Stream | Irrigation | 7.2 | No increase |
| WAR 0 10043 | ~&&e | Manoararere Stream | Irritation | 6.3 | No increase |
| WAR010170 | McLennan | Manlatarere Stream | lrriiation | 26.75 | No increase |
| Total Existing and Requested Allocation from the Lower Reach | | | | | 39.751/s |

"except ti~ose for the Kalpaltangata Stream

# Section H - Glossary

| | |
|---|---|
| Abstractionx~~ | Vc3ns the activiry of taking v:ater from a 'water body |
| Cstchment" | The Land ar-a [hat contributes 10 a river's flow |
| Contaminant[x]* | Includes any substance iinciuding gases, liquids, soiids ind micro-organisms) or energ (excluding noise) or hear, that either by irszlf or in combination wirh the same, similar, or other substances, energy, or heat -<br>[a) when discharged into water, changes or is !ikeiy to :han ge the physical, chemical, or biological condlIiori of water: or<br>[b) when discharged onto or into land or into air, changes or is likely to change the physical, chemical, or biological condition orihe land or air onto or into which it is discharged. |
| Core Allocation | The amount of water thar can be taken out of a river above the minimum flow. |
| Discharge"* | Inciudzs emit, deposit, and allow to escape. |
| DO" | Dissolved os)/gen: oxygen dissolved in the water |
| DoC | Department of Conservation |
| DRP | Dissolved Reactive Phosphorus |
| Effect=" | . ..Unless the Icontext 0therwis.e requires, the term .'effect" includes:<br>ia) Any positive or adverse effect; and<br>(b) Any temporary or permanent effect; and<br>bc (c) Xnq: past, present or future effect; and<br>(d) Any cumulative effect which arises over time or in combination with other effects - regardlEss of the scale, intensir), duration, or frequency of the effect, and ~also includes -<br>(e) Any potential effect oC high probability; and<br>(f) Any potential effect of ION probabiiity which has d high potential impact. |
| Environment** | Includes -<br>(aj Ecosysterrs and their constituent parts, includin g neople and communities; and<br>(b) All natural and physical resources; and<br>(c) Amenity values; and<br>(d) The sociai, economic, aesthetic, and cultural conditions which affect the matrers stated in paragraphs (a) to (c) of this definition or which art affected by those matters. |
| Flow Regime* | .4 description of flow magnitude over time |
| Fresh | A rapid temporary rise in the ;tream discharge and level caused by heavy rains or rapid melting snow and ice. |
| Freshwater'"* | Means all water except coastal water and geothermal water. |
| Groundwater*** | Means water beneath the land surface contained in interconnected pores in the saturated zone. |
| Habitat*"' | Means the environment in which a parricuiar species or group of species lives. It includes the physical and biotic charac:eristics that are relevant to the species concerned. |
| IFLVl | Instream Flow Incremental Methodology - It is a computer based model that quantifies the amount of fish habitat with different fiow levels in a river, by predicting water depths and velocities at different flows. |
| Indigenous"** | in reiation to species means p ants and animals found naturally in New Zealand. |

| | |
|---|---|
| Instream Management Objective* | The objectrve which promotes the sustainable management of an instream value |
| Kaiti3kitanga' "* | Cleans the ex!::':! se oi'gtiardianship by the tangata whenua of an area in accordance with tikanga .CIaori In rc!auor, 10 ndturai and phyi:~cal resources, and includ3 Ihe ethic of sxwardship. |
| l/s | Litres per second |
| Low flow" | The acn~al iicws in a. river ocxrring during the do season of the yea?* |
| Macroinvertebrnte | An acuarrc invertebrate retained by a 0.5mm sieve ar.d iricluding insects, snails, worms and Crustacea. |
| i&Iahing:t kai=** | Means an dr:a where Maori traditionally gathered food;food sources |
| h1.i L F | Mean .Annual Low Flow |
| !\Iauri"*" | The life essence present in things as a result of their being imbued with 'hat character. |
| .YlCI | Macroinvenebrate Community Index. This is a biotic index based around invertebrate tolerances to organic enrichment of stony streams. |
| M E | Ministry for the Environment |
| iCIinirnum Flow"** | 'The minimum flow is a guide that provides an indication of flows in the stream that will:<br>· Safeguard the iifr-supporting capacity of ecosystems<br>· Meet the: needs of future generations; and<br>· Provide for adequate water quality<br>Under most circumstances, the flows in a stream should not fall below this. However in low flow conditions. streams may occasionally drop below the minimum flows even if no water is abstracted. |
| NIW.4 | Kational Inst:tute of Water and Atmospheric Research |
| lVon point source discharge xY'" | Means drffuse discharges of contaminants to air, water and land which are not attributable to an individual sit< or activity. |
| Periphyton | A group of organisms in aql.nrtic environments specialised to live on and exploit much larger (usually inert) suri'aces. Groups of organisms include fungi, bacteria, protozoa, and algae. |
| Point source discharge**" | Discharges of contaminants from a sing!e or identifiable source. |
| Reach* | .A stretch of river with similar characteristics, often defined by upstream and downstream tributaries, or significant geological contra s, or bed controls |
| RFP | Regional Freshwater Plan for the Wellington Region |
| Riffle* | Shallow part of river where water flows brokenly |
| Riparian | Land that adjoins or directly influences, or is influenced by, a body of water |
| River** | Means a continually or intermittantly flowing body of freshwater; and includes a stream or modified watercourse; but does not include any artificial watercourse. |
| RPS | Regional Policy Statement for the Wellington Region |
| SQMCI | Semi-Quantitative Macroinvertebrate Community Index - See MC1 |
| Stream*"* | Has the same meaning as in he interpretation of river in the RMIA |
| Supplementary Allocation | This is where water can be h,arvested at higher flows when the core allocation is fully taken. |
| Surface Water**" | Means the water in rivers, lakes and wetlands. |

[18] Smakhtin. *3001 Low ,%m~ iiydroiogy .4 Revrew.* Journal of Hydrology 140 (2001) 147-186

| | |
|---|---|
| Tangata whenua"“" | In relation to a Farticular area, means the iwi, or hapu, mat hoids mana whenua lover that area |
| Tikanga iClaoriT[i]* | Means Maori customary vaiues and practices. |
| Tributaries | A stream, rivx or glacier that feeds another larger one. |
| Wuahi tapu"‘" | Means scared site; defined locally by the hapu and iwi, which are the kaitiaki for the waahi tapu. |
| W.41OR.4 | Water .4liocation Impacts on River Attributes, also L,!aori word for health/fountain. It is a compurer package that ‘can assist resource managers to predict the impact of changes in low flow on river ecology. |
| Water body*[x] | means fresh ;vater or geothermal water in a river, lake, stream, pond, wetland, or aquifer, or any part thereof, that is not IocateC within the coastal marine ,area. |
| WI;‘& | Weighted Usable .-‘irea- ‘The total area of suitable habitat across a reach (or group of crosxections) |

Definitions sourcod from:

h *Flow Guidelinesfoior Instream Values, Mk, 1998*
** The Resource Management Act 1991
*** *Rqyional Freshwater PlanJbr the Weliington Region,* 1999

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