Source: Hughey, K.F.D., Baker, M-A. (eds). (2010b). The River Values Assessment System: Volume 2: Application to cultural, production and environmental values. LEaP Report No.24B, Lincoln University, New Zealand.

Part B: Natural character in Tasman district: Application of the River Values Assessment System (RiVAS)

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11.3 Introduction

11.3.1 *Purpose*

This section presents the second application of the River Values Assessment System (RiVAS) to natural character (the first was a trial application in the Marlborough District – see Deans et al. Part A, Herein) in the Tasman District, undertaken during July-September 2010. The full method is outlined in Hughey et al. (Chapter 3, Herein) – this Tasman natural character report needs to be read in conjunction with the method and with Part A of this chapter.

11.3.2 *Process*

In applying the method to natural character in Tasman District the Expert Panel first appraised themselves of the Marlborough DC application to see if any further development of the system, within a different context, was necessary. Several modifications were discussed and subsequently accepted, namely:

- During the Tasman application it became clear that context was very important. The rivers of Tasman are subject to significantly different climatic, geomorphological, vegetation and hydrological influences to those of Marlborough. Consequently it is proposed that important and relevant context information be included in all applications of the method, not just for Natural Character.
- Geographically Tasman is an extremely diverse District. The approach used in this exercise has therefore distinguished between river reaches in public administered lands and those in private ownership and has often lumped together many similar smaller rivers flanking certain catchments. Lumping categories inherently runs the risk of 'averaging' scores when some of those rivers or tributaries within such groups may have a dam, or water take, for example, and others don't. Wherever possible, we have identified where these have occurred by way of a comment in the appropriate cell in the spreadsheet. The only alternative is to separate all these out. We have left an example of this problem in the form of a difference of view in respect of the lower Aorere channel shape (site 14). While we agreed that the river above Rockville is relatively unmodified (scoring 4), below Rockville it scores a 3. In the Marlborough application such cases were separated out into different reaches, while in Tasman they tended to be lumped together. Marlborough has the benefit however, outside the Sounds, of having far fewer rivers. In both regions, smaller rivers which lacked data or personal knowledge of the panellists were excluded from the analysis. Neither of these regions have many highly modified streams by comparison with more intensively farmed or urbanised regions, however.
- There was considerable discussion around the merits or otherwise of developing 'significance' scores for natural character. Ultimately the group was convinced by the argument that natural character in terms of section 6(a) of the RMA 1991 recognises that the protection of the natural character alongside water bodies (vis-a-vis, forests), is a matter of national importance

irrespective of 'value'. The point of the principle is to direct the appropriateness of development in those sites to the level of natural character which the water body (and its margin) holds. The relative ranking of natural character will also help guide decisions about resourcing and management effort. As a consequence 'national importance', 'regional importance', or 'local importance' has little meaning or utility compared for section 6(c) values where it is a requirement and does have utility.

- There was broad agreement around the primary attributes but some further work was needed on some indicator significance thresholds, specifically in terms of:
  - Channel shape - where a score of 5 was changed from "A very highly natural river with no or very few modifications to its channel shape" to "A very highly natural river with no modifications to its channel shape" – this was agreed because a score of 5 should apply an environment of pristine natural character;
  - Character modifications - where a score of 4 was changed from "Fragmented indigenous and rural landscape" to "Fragmented indigenous and rural landscape including a few areas of commercial exotic forestry" – this was agreed upon as the existing definition was too narrow.
- The Expert Panel was concerned also about the criteria used to assess relativity, in particular the inclusion of a distance criterion in the Marlborough evaluation. For Tasman and other applications this criterion is removed. It is a scale issue and comes down to the proportional effect of some alteration to natural character on the whole of a particular water body;
- Finally there was further discussion around the 1-5 scale used only for the natural character value (all others use 1-3 to reflect the local, regional, national importance range). It was agreed that consideration of the components of natural character requires consideration of matters on a 5 point scale, which would therefore be retained. Having said this, a comparative evaluation of converting 4-5 to 3; 3 to 2 and 2-1 to 1 made very little difference and might be used at a later date for other purposes[1].

11.3.3 *Preparatory step: Establish an Expert Panel and identify peer reviewers*

The Expert Panel for the natural character application in the Tasman District comprised Debs Martin, Neil Deans, Sue Brown, Barbara Stuart and Martin Doyle; advised by Ken Hughey (Lincoln University) who managed the case application. Credentials of the Expert Panel are provided in Appendix 11B-1.

11.4 Application of the method

11.4.1 *Step 1: Define river value categories and river segments*

River value context for natural character in Tasman

The natural character of rivers in Tasman District is highly diverse due to large variations in rainfall, geology and land use. All of the main rivers begin in pristine national or forest parks. Most rivers – with the exception of some on the western coast - flow through channels which have been altered to some degree, and all are surrounded by farmland in their lower reaches. Untouched natural landscape is apparent in at least some part of the upstream vista for most reaches of all rivers. Water quality, especially clarity, is often exceptional in the public conservation estate. These extensive tracts of Tasman rivers have very little, if any, sign of human modification.

To the south are the mid and upper sections of the large Buller catchment which flows through alluvial flats in the upper section, then through intermittent gorges of incised rock. Large tracts of the upper watershed are contained with two separate National Parks. Flows are large and relatively unaltered by man.

1 For example within the FRST funded C09X1003 research project entitled: Integrated Valuation and Monitoring Framework for Improved Freshwater Outcomes, which runs from 2010-2013 and which draws extensively from this project work.

Smaller streams feature throughout the District, and some, like those within Abel Tasman National Park, flow through largely unmodified indigenous vegetation to the sea. Short rivers on the west coast are largely contained within Kahurangi National Park, and this dominates their natural character.

The Takaka catchment is known for its diverse geology, with karst features dominating in the mid and lower reaches. The marble geology has resulted in Te Waikoropupu Springs, the largest in NZ. A large hydro reservoir was built in the Cobb tributary and flows in the lower reaches are greatly modified by hydro power operations.

The Richmond Forest Park headwaters of the eastern stretch of the Motueka produce river water of exceptional clarity. The western side largely drains from Kahurangi National Park (including resurgence through the marble on the Arthur Range and is pristine in nature. Forestry and farming dominate land-use through the central band of the catchment right to the sea.

Richmond Forest Park provides a backdrop to forestry and farming on the eastern side of the District, and these land-uses set the natural character for the Waimea River, which becomes increasingly modified down its length, particularly in shape and river flow.

River segments

Based on the above it was decided to clump rivers as appropriate (typically smaller catchments flowing directly to the sea through pastoral or native vegetation dominant habitats), and to split where appropriate (e.g., in large catchments with multiple land uses and land tenures, and where also there were major geographical differences. This rationale kept the application manageable, i.e., ultimately 43 units were evaluated by the Expert Panel.

11.4.2 *Step 2: Identify attributes*

Attributes, are the facets of the natural character river value. The same attributes as used by Deans et al. (Part A, herein) for Marlborough were considered here.

11.4.3 *Step 3: Select and describe primary attributes*

The same eight primary attributes used by Deans et al. (herein) are used here and appear as part of Appendix 11B-2 and 11B-3.

11.4.4 *Step 4: Identify indicators*

The same indicators used by Deans et al. (herein) are used here and appear as part of Appendix 11B-2 and 11B-3.

11.4.5 *Step 5: Determine indicator thresholds*

Thresholds are applied to an indicator to determine very high, high, medium and low and very low relative importance for that indicator. Thresholds are defined by real data, e.g., for native bird habitat distinctiveness: 1= low; 2= medium; 3= high. Threshold data result from the following assessment:

1. Habitat type or species assemblage/presence widely represented elsewhere in NZ;
2. Habitat type or species assemblage/presence rarely represented elsewhere in NZ; and
3. Habitat type or species assemblage/present not represented in other regions in.

11.4.6 *Step 6: Apply indicators and indicator thresholds*

Most indicators were assessed using Expert Panel based survey data (see Appendix 11B-3) - this step involved entering data from the relevant data sources (primarily the experts).

11.4.7 ***Step 7: Weighting of primary attributes***

The Expert Panel reviewed the eight primary attributes and considered whether some made a relatively greater contribution to natural character as a whole. In the case of natural character, it was considered that all attributes chosen made an equal contribution. The decision was reached, as per the Marlborough (Deans et al. Part A, herein) application to keep weightings equal.

11.4.8 ***Step 8: Determine river importance***

Step 8a: Rank rivers

The spreadsheet in Appendix 11B-3 was used to sum the indicator threshold scores for each river. The sums of the indicator threshold scores were placed in a column and then sorted in descending order. This provided the list of rivers ranked by their relative importance scores.

Step 8b: Identify river importance

Using the list from Step 8a, the Expert Panel closely examined the rivers, and their attribute scores.

Each of the 8 attributes was ranked in relative importance from 1 to 5, with a score of 5 signifying the most natural character. The highest possible score a river or reach can obtain is 40, and the lowest is 8, and the range of scores is therefore 32.

To obtain relativity between scores, they were graded into 5 classes, the middle classes spanning a score of 8. The two classes at the end of the scale range over 4 numbers which reflects both the extreme nature of these scores and that it's not possible to get below 8 or greater than 40.

Midpoints for each class were calculated beginning with the 'average' class centred on the mid-point value of 24 which is ½ way between the lowest possible score of 8 and the greatest score of 40.

The arithmetic requires that one class should have a range of 9, and this was applied to the middle class to prevent biasing either end.

Thus, consistent with the above and as per the modifications made to the Marlborough approach the following criteria were applied to defining relative importance within the Appendix 11B-3 evaluation:

Total score	**Degree of naturalness**	**Relative natural character ranking**
37-40	Most natural	Very high
29-36		High
20-28	Average	Moderate
12-19		Low
8- 11	Least natural	Very low

11.4.9 ***Step 9: Outline other factors relevant to the assessment of importance***

In future applications team membership should include a landscape architect/landscape ecologist or equivalently qualified expert experienced with natural character.

11.4.10 ***Step 10: Review assessment process and identify future information requirements***

No matters arose in relation to this work.

References

Deans, N., Wadsworth, V., Williman, B., Hawes, P., Rackham, R. and Bentley, J. (herein). *Natural Character: Application of the River Significance Assessment Method to Marlborough District*.

Hughey, K., Booth, K., Deans, N., and Baker, M-A. (herein). *Chapter 3, A significance assessment method for river values*.

Appendix 11B-1
Credentials of the Expert Panel members

The Expert Panel comprised five members, and the facilitator Ken Hughey. Their credentials are:

Neil Deans BSc (Hons); Dip P&RM. Neil is the Manager of Nelson/Marlborough Fish and Game and has a national Resource Management Coordinator role. He is intimately familiar with many water bodies throughout the country, having undertaken field work from Stewart Island to Northland over a 25 year career. He has written or presented many papers, articles and reports on freshwater fisheries, wildlife, outdoor recreation and conservation here and overseas. He is the Immediate Past President of the New Zealand Freshwater Sciences Society and has provided advice to many national projects, including Water Conservation Orders on the Buller and Motueka; a review of the Dairying and Clean Streams Accord; is on the Waimea Water Augmentation Committee; advised on National Environmental Standards for Ecological Flows and Plantation Forestry; been involved with the integrated catchment management research project on the Motueka River; is on the Advisory Board for Lincoln/Canterbury Universities Waterways Centre and helps oversee Canterbury's Land Use and Water Quality Project. He has been heavily involved in the recent collaborative processes of the Land and Water Forum.

Sue Brown is chair of the dairy section of Golden Bay Federated Farmers.

Barbara Stuart is the Top of the South representative for New Zealand Landcare Trust. She has encouraged and assisted in the setting up of many landcare groups across the region to address water quality issues and has a wide knowledge of Tasman District Council rivers.

Debs Martin has worked for Royal Forest & Bird Protection Society of NZ (Inc) for the past 6 years as a Field Officer in the Top of the South Island. She has a Masters degree in Geography (1st class honours) from Canterbury University. Some of her post-graduate research focussed on the geomorphologies of braided river systems. Along with a past history as a raft guide, Debs has a broad knowledge of both the rivers and the flora and fauna within and alongside.

Martin Doyle NZCS (Water Science), Grad Dip (Hydrology). Through his role as Co-ordinator of Environmental Monitoring for Council, Martin has collected water flow and water quality information from Tasman rivers for 30 years, and is the principal analyst of hydrological data for Council. He also holds district wide responsibility for flood warning. Through work or personal pursuits he has waded through or travelled alongside considerable reaches of most rivers in the district.

Ken Hughey is Professor of Environmental Management at Lincoln University. His expert knowledge of multiple aspects of freshwater management spans the period 1981-2010. Ken is the project leader of the river values work and has co-authored many of the reports and conference papers concerning this work.

Appendix 11B-2
Assessment Criteria for Natural Character (Steps 2-5)

Attribute clusters	Attribute (primary attributes in bold)	Description of Primary Attributes	Indicators	Indicator Significance Thresholds	Data Sources (and reliability)
Step 2: Identify attributes and Step 3: Select and describe primary attributes		*Step 3: Select and describe primary attributes*	*Step 4: Identify indicators*	*Step 5: Determine significance thresholds*	
River Channel	**Channel shape**	Modification to cross section (e.g., slope-banks) and long section (e.g., cut through meanders) .This also includes changes to a river bed width (e.g., narrowing of the channel), which is commonly undertaken in modified rivers with valuable land adjacent. Changes to the bed sediment should also be taken account of in this attribute.	Aerial photographs, river cross sections, changes in river width/ length and water allocation resource consents (where available). Judgement from Expert Panel was also required due to limited available data for all rivers.	Judgement made on a five-point scale: 1= Very Highly modified river, (i.e., straightened and channelised, often with concrete or rock fill banks) often within an urban context; 2= A highly modified channel shape or width but with semi natural reaches or channel shapes in some areas; 3= A river displaying a patchwork with moderate natural channel shape in places together with many human influences such as long stretches of stopbanks, groynes; 4= A highly natural river displaying occasional pockets or individual minor modifications to its channel shape (i.e., small stopbanks or groynes); 5= A very highly natural river with no modifications to its channel shape.	Regional council, NIWA or other water quality data [i.e., GIS data]. Aerial photography.

Attribute clusters	Attribute (primary attributes in bold)	Description of Primary Attributes	Indicators	Indicator Significance Thresholds	Data Sources (and reliability)
	Degree of modification of flow regime	Hydrological information on a river's low, median and mean flows assist in determining natural character. Substantial flow that appears to fit the nature and scale of the channel may suggest a higher degree of natural character. Dewatered bed or 'misfit' flows suggest upstream diversions, which reduce natural character.	Change to natural flow regime. % Flow rate modification (would show low flows). Would need to know the flow data for each river. Expert Panel judgement based on quantitative data available.	Judgement made on a five-point scale: 1= Very highly modified or diverted flow/ water-take (e.g., large-scale dams; take averaging 50% or more of median flow) 2= Highly modified or diverted flow (e.g., small-scale dams, irrigation or flood channels); 3= Moderately modified or diverted flow (e.g., several irrigation takes taking a moderate proportion of MALF); 4= Relatively low levels of modified or diverted flow (e.g., few irrigation takes taking minor proportion (<5%) of low flow); 5= Highly natural flow regime with no modifications to the flow pattern.	
	Water Quality	Perception of the water quality, especially its clarity, colour, etc.	Information from council or other parties. Also judgement from Expert Panel taking account of visual and biological aspects where they apply, particularly water clarity, nutrient content, temperature, salinity and faecal coliforms.	Judgement made on a five point scale: 1= Very highly contaminated or permanently discoloured water displaying very high levels of human-induced changes to the water quality with limited life supporting capacity (e.g., within polluted urban/ industrialised areas or intensive farming); 2= Water usually displaying high levels of contamination mainly from adjacent diffuse sources from land use activities (agricultural leaching, etc.); 3= Water displaying reasonable levels of naturalness although contains occasional high-moderate levels of human induced changes to part of the waterway or at some times; 4= Water displaying relatively high levels of water quality with small or rare amounts of impurities caused further upstream (e.g., by occasional stock crossing or forest harvesting); 5= Highly natural water quality displaying no human induced changes	Regional council, NIWA or other water quality data

Attribute clusters	Attribute (primary attributes in bold)	Description of Primary Attributes	Indicators	Indicator Significance Thresholds	Data Sources (and reliability)
	Exposed riverbed	Extent of the exposed bed appropriate for river type (and flows) would assume higher natural character than one with unexpected areas of exposed bed not relating to flows.	Not all river types have exposed areas; depends on flow regime and nature of the channel. Furthermore, difficult to judge for a braided river.		
	Bed material substrate	Exposed bed material appropriate for river type (i.e., size, geology for type of flow)	Visible geological make-up of the river substrate/ bed. Expert Panel judgement.		
	Exotic 'aquatic' flora and fauna within the river channel	Presence of aquatic flora and fauna within the river channel (including waterweeds, pest fish (which include trout and salmon), the eggs and fry of pest fish, and the invasive alga, e.g. didymo) can reduce the natural character of the river. This does not include vegetation on 'islands' within the river channel. This is contained under 'riparian vegetation'. Algal bloom may be evident in some rivers due to seasonal low flows. Expert ecological judgement will be required to assess extent and may have a bearing on the degree of naturalness of this primary attribute.	Expert Panel judgement, looking at volume, variety.	Judgement based on a five-point scale: 1= River system choked with exotic aquatic flora and fauna; 2= Large areas of introduced flora and fauna (including pest fish) evident (in approximately 75% of river); 3= Occasional stretches (some quite long) of introduced flora and fauna evident within waterway (approx. 50% of river); 4= Small, often isolated pockets of introduced flora and fauna evident(less than 20% of total river), however river displaying very high levels of naturalness; 5= No evidence of introduced flora or fauna within the water channel.	
	Structures and human modifications within the river	Including dams, groynes, stopbanks, diversions, gravel extractions which may affect the level of natural character of the river channel.	Expert Panel judgement based on knowledge of river, assisted by aerial photos, council GIS, REC and LCDB. Linear measurement/ %	Judgement based on a five-point scale: 1= River channel completely modified or artificial (i.e., dam/ weir/ flood defence structure); 2= Significant parts of the river channel have been affected or encroached upon by human intervention (i.e., a suburban/ highly managed agricultural land,	

Attribute clusters	Attribute (primary attributes in bold)	Description of Primary Attributes	Indicators	Indicator Significance Thresholds	Data Sources (and reliability)
	channel		proportion of human modification.	including: gravel workings, part-channelisation); 3= Occasional 'reaches' of human modifications (i.e., a settled rural landscape with bridge/ aqueduct supports, pylon footing); 4= Limited human intervention (i.e., occasional bridge abutments/ power pole within the river channel); 5= Overwhelmingly natural with no/ very limited evidence of human interference.	
Riparian Edge	**Vegetation cover in the riparian edge**	Dominance of native communities in natural patterns (the presence of exotic species in natural patterns will reduce natural character but is of higher naturalness than the absence of such vegetation (unless this is natural) or the presence of planted vegetation). This includes all bankside vegetation as well as vegetation within 'islands', such as those within braided river systems. Vegetation comprises all types, including grasses, remnant scrub, shrubs and trees. In some instances, the natural elements and patterns indicate limited vegetation (i.e., high country rivers), where native grasses or herbs are the only form of vegetation in the area.	Proportion of native vegetation against other vegetation. Extent to which river processes have generated natural vegetation patterns. Expert Panel judgement based on REC (LCDB) and aerial photographs to assist in determining vegetation cover.	Judgement based on a five point scale: 1= Complete absence of vegetation due to human-induced changes (or limited presence (in pockets) of exotic vegetation such as occasional willow, gorse or buddleia); 2= Exotic vegetation with complete absence of native species within a pastoral/ semi urban setting; 3= Predominantly exotic vegetation in natural patterns (i.e., willows/ gorse) and/ or patches of remnant indigenous vegetation; 4= Fragmented areas of native and exotic vegetation in natural patterns. Predominance of native vegetation; 5= Overwhelmingly indigenous vegetation with no or few introduced species.	River Environment Classification system (REC), developed by NIWA, (good)
	Extent of exotic flora	Proliferation of exotic flora.	% of exotic vegetation on REC (LCDB)		
	Structures and human modificati	Include bridges, roads. All potentially impact on the naturalness of a river. An absence of human modifications. However minor, structures particularly if	Expert Panel judgement with potential to base it on LCDP and REC GIS layers. Linear	Judgement based on a five-point scale: 1= Major modification to the riparian edge (i.e., dam/ weir/ flood defence structure); 2= Significant parts of the riparian edge have been	River Environment Classification system

Attribute clusters	Attribute (primary attributes in bold)	Description of Primary Attributes	Indicators	Indicator Significance Thresholds	Data Sources (and reliability)
	ons in the riparian edge	constructed from natural or local materials may not influence natural character greatly, but will have a localised effect. The scale and nature of modifications will influence the effect on natural character.	measurement/ Number of structures.	affected by human intervention (i.e., a suburban/ highly managed agricultural land, including: gravel workings, part-channelisation, marinas); 3= Occasional 'pockets' of human modifications (i.e., a settled rural landscape with bridge/ aqueduct supports, boathouses); 4= Limited human intervention (i.e., occasional bridge/ power pole/ jetty); 5= Overwhelmingly natural with no/ very limited evidence of human interference.	(REC), developed by NIWA, (good); Aerial photos LCDP (good)
Wider landscape character	**Character modifications**	Broader scale landscape modification beyond the immediate river margin, leaching from agricultural land, intensification of land use all impact on natural character. Protected natural areas such as reserves, parks and estates managed by DoC indicate a higher natural character. Catchment modifications if ecologically or visually linked to the waterway.	Expert Panel judgement based on intensification of land use adjacent to river (includes more distant views beyond the river banks). Expert Panel to rank from indigenous bush to urban scenarios. Use of LCDB and Landscape Assessments to inform decision.	Judgement based on a five-point scale: 1= Heavily modified landscape (urban or highly intensive setting) with limited vegetation; 2= Suburban/ highly managed agricultural landscape; 3= Settled pastoral landscape with areas of commercial forestry and pockets of indigenous vegetation; 4= Fragmented indigenous and rural landscape including a few areas of commercial exotic forestry; 5= Overwhelmingly indigenous landscape with no or very little human modification.	District or regional wide Landscape Assessments

Appendix 11B-3
Significance assessment calculations for natural character (Steps 1 and 5-8)

River name and Project ID number			Attribute cluster								TOTAL (1-5 scale)	Significance
			River channel					Riparian edge		Wider Landscape		
			Primary attribute									
			River Shape	Flow regime	Water Quality	Absence of exotic flora/ fauna	Structures/ human modification	Extent of native flora	Structures/ human modification	Landscape character		
Upper Buller	1	South of mainstem - above road ends/in CL	5	5	5	5	5	5	5	5	40	Very high
	2	North of mainstem - above road ends/in CL	5	5	5	5	5	5	5	5	40	Very high
Mid Buller	3	Mainstem Rotoiti to TDC boundary	4	4	4	4	3	4	3	4	30	High
	4	Maruia	5	5	4	4	4	4	4	4	34	High
	5	Matakitaki	4	4	3	4	4	3	3	4	29	High
	6	Mangles	5	4	3	4	4	3	3	4	30	High
	7	Gowan	4	5	5	4	4	4	4	4	34	High
	8	Hope	4	3	4	4	4	5	3	4	31	High
	9	Owen	4	4	4	4	4	3	3	4	30	High
	10	Matiri	4	2	4	4	4	4	4	4	30	High
West Coast	11	Rural coastal (including Whanganui Inlet)	4	4	4	5	4	3	4	4	32	High
	12	Protected (CL & covenants) land rivers	5	5	5	5	4	5	5	5	39	Very high
Upper Aorere	13	Upper Aorere: Includes Quartz Range, Mainstem & tributaries to Browns Hut (Clark confluence), Nth Tributary CL	5	5	5	5	4	5	5	5	39	Very high
Lower Aorere	14	Mainstem Reach sea to Browns Hut	3, 4	5	4	4	4	4	4	4	29	High
	15	Lowland Aorere Tributaries (farmland)	4	4	3	4	2	3	2	4	26	Moderate
Takaka	16	KNP rivers from Parapara to Rangihaeta	5	4	5	5	4	5	4	5	37	Very high
	17	Streams coastal and rural from Parapara to Rangihaeta, west side	4	4	3	4	2	3	2	4	26	Moderate
	18	Upper Takaka KNP incl. Above Cobb reservoir	5	4	5	5	4	5	4	5	37	Very high
	19	Te Waikoropupu Springs and river	4	1	3	3	3	3	3	3	23	Moderate
	20	Motupipi	3	2	2	3	2	2	2	2	18	Low
	21	Takaka eastern tributaries up to and including Waitui at confluence	4	3	4	4	4	4	4	4	31	High
	22	Takaka mainstem below Waitui confluence. to sea	3	1	3	3	3	2	2	3	20	Moderate
	23	Takaka mainstem below powerhouse and lower Cobb below reservoir to Waitui confluence	3	1	3	3	3	3	3	4	23	Moderate
Abel Tasman NP rivers	24	Including Wainui and all in NP	5	5	4	5	5	4	4	5	37	Very high
	25	Marahau & Otuwhero outside NP	4	4	4	4	4	2	3	3	28	Moderate
Riwaka	26	Upper - boundary native vegetation	5	5	5	5	5	5	5	5	40	Very high
	27	Lower - bound is native vegetation	3	3	4	4	3	3	2	3	25	Moderate
Motueka	28	West Bank-Arthur Range exotic forestry	4	4	3	4	4	3	3	3	28	Moderate
	29	West Bank-Arthur Range to but not including Wangapeka - native forest	5	5	5	5	5	5	4	5	39	Very high
	30	Upper Wangapeka (in NP)	5	5	5	4	5	5	5	5	39	Very high

	31	Lower Wangapeka (includ Sherry) and Tadmor	4	4	4	4	4	3	3	3	29	High
	32	Upper Motueka above Blue Glen	5	5	5	4	5	5	5	5	39	Very high
	33	Motueka mainstem from Blue Glen to Wangapeka confluence	3	3	4	4	4	2	2	3	25	Moderate
	34	Motueka mainstem from Wangapeka confluence to sea	3	4	4	4	4	3	3	3	28	Moderate
	35	Mid Motueka tributaries - above Dove and including Blue Glen and Motupiko	4	3	4	4	3	3	3	3	27	Moderate
	36	Lower Motueka eastern tributaries - including Dove to the sea	4	3	4	4	3	3	2	3	26	Moderate
Moutere	37	Moutere tributaries and coastal streams on Moutere-Waimea plain	2	2	3	3	2	2	2	2	18	Low
	38	Moutere mainstem to top of 'NZ Company Ditch' from sea	1	2	3	3	1	2	2	2	16	Low
Tasman Bay Springs	39	Motueka-Richmond, e.g., Pearl Ck, Neimans	3	3	4	3	2	3	2	2	22	Moderate
Waimea	40	Upper eastern tributaries in native forest, including CL	5	4	5	5	5	5	5	5	39	Very high
	41	Mid - eastern foothills in production/farm	4	3	4	4	3	3	3	3	27	Moderate
	42	Mid - Moutere gravels = Wai-Iti	3	3	3	3	2	3	2	2	21	Moderate
	43	Lower Waimea from Wairoa gorge down	2	2	4	4	2	2	2	2	20	Moderate

Key to rankings:

Total score	**Relative importance ranking**
37-40	Very high
29-36	High
20-28	Moderate
12-19	Low
8- 11	Very low

From Canterbury Strategic Water Study
[1] Average Annual Rainfall (mm) over irrigable area (nearest rainfall site)
[1] From Canterbury Strategic Water Study. Some areas assigned by expert opinion
[1] with 1 being low risk and 5 being high risk (expert assessment)
[1] Bypass solution ranking from % of irrigable area (maps from CSWS)
[1] Socio-economic benefit -ranking 1 (low) - 3 (high) Expert assessment
[1] Irrigated area and size of resource cubed, reliability soil moisture and alternative supply +50%, remainder aggregated. Weighting for irrigable area and size of resource only applies if Soil Moisture deficit is >1, otherwise they receive a 50% weighting.
[1] National - irrigated area 3, size of resource 3, soil moisture deficit 2 or greater. Local - resource size = 1, irrigated area = 1 or no soil moisture deficit. Remainder regional
[1] Expert opinion and various prefeasibility studies
[1] Average Annual Rainfall (mm) over irrigable area (nearest rainfall site)
[1] From GIS
[1] with 1 being low risk and 5 being high risk (expert assessment)
[1] Alternative supply ranking from expert opinion
[1] Socio-economic benefit -ranking 1 (low) - 3 (high) Expert assessment
[1] Irrigated area and size of resource cubed, reliability soil moisture and alternative supply +50%, remainder aggregated. Weighting for irrigable area and size of resource only applies if Soil Moisture deficit is >1, otherwise they receive a 50% weighting.
[1] National - irrigated area 3, size of resource 3, soil moisture deficit 2 or greater. Local - resource size = 1, irrigated area = 1 or no soil moisture deficit. Remainder regional