Swimming in Hawke's Bay: Application of the River Values Assessment System (RiVAS and RiVAS+)

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1. INTRODUCTION

1.1 PURPOSE

This report presents the results from an application of the River Values Assessment System (RiVAS) for river swimming in the Hawke's Bay Region. A workshop was held on 18 October 2011 to apply the method to Hawke's Bay rivers.

1.2 RIVER VALUES ASSESSMENT SYSTEM (RIVAS)

Hughey and Baker (2010) describe the RiVAS method including its application to river swimming. Table 1 provides a summary of the method.

Table 1: Summary of the River Values Assessment System method

Step		Purpose
1	Define river value categories and river segments	The river value may be subdivided into categories to ensure the method is applied at a meaningful level of detail. Rivers are listed and may be subdivided into segments or aggregated into clusters to ensure that the rivers/segments being scored and ranked are appropriate for the value being assessed. A preliminary scan of rivers in the region is undertaken to remove those rivers considered to be of 'no' or less-than-local level significance for the value being considered.
2	Identify attributes	All attributes are listed to ensure that decision-makers are cognisant of the various aspects that characterise the river value.
3	Select and describe the primary attributes	A subset of attributes (called primary attributes) is selected and described.
4	Identify indicators	An indicator is identified for each primary attribute using SMARTA criteria. Quantitative criteria are used where possible.
5	Determine indicator thresholds	Thresholds are identified for each indicator to convert indicator raw data to 'not present', 'low', 'medium', 'high' (scores 0-3)
6	Apply indicators and indicator thresholds	Indicators are populated with data (or data estimates from an expert panel) for each river. A threshold score is assigned for each indicator for each river.
7	Weight the primary attributes	Primary attributes are weighted. Weights reflect the relative contribution of each primary attribute to the river value. The default is that all primary attributes are weighted equally.
8	Determine river significance	Indicator threshold scores are summed to give a significance score (weightings applied where relevant). Rivers are ordered by their significance scores to provide a list of rivers ranked by their significance for the river value under examination. Significance (national, regional, local) is assigned based on a set of criteria or cut off points.
9	Outline other relevant factors	Factors which cannot be quantified but influence significance are recorded to inform decision-making.

Step		Purpose
10 - 13	Apply to potential river scenarios (RiVAS+)	Relevant steps are repeated for potential future river conditions.
14	Identify information requirements	Data desirable for assessment purposes (but not currently available) are listed to inform a river value research strategy.

1.3 SUMMARY OF THIS ASSESSMENT

The Expert Panel (see Appendix 1) used eight resource and user attributes to assess 49 known river swimming locations in the Hawke's Bay Region. The method was applied to differentiate swimming sites of regional significance (n=9) from those of local significance. Few data were available, so the Expert Panel relied on their own assessments for most attributes. Minor revision was made to the travel distance attribute threshold, and the RiVAS+ methodology was also applied to assess future potential value of swimming sites. This suggested that the four sites could be of regional swimming value (rather than local significance in their existing state) if identified management actions were taken to enhance the site for swimming.

2. APPLICATION OF THE RIVAS METHOD: CURRENT STATE OF RIVERS

STEP 1: DEFINE RIVER VALUE CATEGORIES, RIVER SITES AND LEVELS OF SIGNIFICANCE

The Expert Panel confirmed the definition of 'swimming' as:

1. Contact recreation (participants get wet).
2. Site-focused (participants get in and out of the water at the same location).
3. No commercial dimension (swimming is not offered as a stand-alone[1] commercial recreation opportunity).

This definition encompasses swimming, playing around in the water, paddling and jumping off bridges/rocks into the water. While these different activity styles may require different resource conditions (e.g., shallow slow-moving water c.f. deep holes) the Expert Panel believed they could be addressed collectively.

Swimming is site-specific. A list of 51 swimming sites was compiled using information from the Council's water quality monitoring sites, and sites known to the Expert Panel from their local knowledge (see Appendix 4). It has been assumed that any sites where swimming takes place which are not listed are of only highly localised value (in their existing state). Swimming sites without public access were excluded from the analysis.

Rivers within coastal lagoons were noted as areas where people swim; however, estuaries were excluded from this assessment to be consistent with the approach taken for other values assessed using RiVAS for the Hawke's Bay Region.

Following the RiVAS method for swimming (Hughey and Baker 2010), it was agreed that the method would be used to identify regionally and locally significant swimming sites (not national significance). It was noted that swimming as an activity (or river value) is nationally significant.

[1] Some commercial recreation trips may incorporate swimming as part of the experience.

STEP 2: IDENTIFY ATTRIBUTES

Attributes to describe river swimming are presented in Appendix 2. These were adopted from the most recent application of RiVAS for river swimming (Tasman District – Booth et al. 2010a). The Expert Panel identified two additional attributes that they believed influenced swimming: macrophyton (water weed), and consistent year-round flow (some rivers dry up). These were added to the list of attributes (Appendix 2) and indicated in blue font.

STEP 3: SELECT AND DESCRIBE PRIMARY ATTRIBUTES

Primary attributes are those attributes selected to represent swimming within the RiVAS method. These were adopted from the most recent application of RiVAS for river swimming (Tasman District – Booth et al. 2010a). Appendix 2 identifies the eight primary attributes (in bold) and describes them.

STEPS 4 & 5: IDENTIFY INDICATORS AND DETERMINE INDICATOR THRESHOLDS

The indicators adopted to measure each primary attribute are presented in Appendix 2, together with their thresholds, and indicators are assessed against SMARTA criteria in Appendix 3. Indicators and thresholds were adopted from the most recent application of RiVAS for river swimming (Tasman District – Booth et al. 2010a).

Where the character of Hawke's Bay rivers is likely to differ from other regions, this is noted below, together with any assumptions made by the Expert Panel.

1. *Water clarity:* Horizontal visibility

   The Council measures turbidity rather than clarity (i.e., does not use black disc metric). It was noted that Hawke's Bay rivers are affected by high rainfall (the water turns brown) and so the assessment assumed measurement was not after a rain event.

2. *Swimming holes:* Maximum water depth

   Depth was considered at the time of peak use (summer), which is normally low flow. In the case of tidal reaches, the assumption was made that the tide was high.

3. *Variable water depth:* Morphological variability

   No particular assumptions.

4. *Algae:* Compliance with national guidelines

   Data were available for some sites as part of the water quality monitoring programme. Because the Panel was particularly concerned about macrophyton (water weed), this was factored into assessment of this attribute.

5. *Scenic attractiveness:* Overall rating

   No particular assumptions.

6. *Origin of users:* Kms travelled that day (from previous night's accommodation)

   Users have to travel a long distance to reach sites with high water quality in the Hawke's Bay. For this reason, the upper threshold was altered from >20 kms to >30 kms.

7. *Levels of use:* Number of swimmers per day

   High use was considered to be 30 swimmers per day. Two sites scored highly because they were next to a beach: people using the beach also swam in the river. Without this co-location factor, these sites would have lower scores.

8. *Presence of facilities*

   The Hawke's Bay region does not have many facilities (toilets or camp sites) by rivers, so it was thought that this attribute may not differentiate rivers very well.

STEP 6: APPLY INDICATORS AND INDICATOR THRESHOLDS

Expert Panel estimates were required for all indicators (Appendix 4). However, some information was available to inform these estimates including: the Council's Recreational Water Quality Monitoring Programme (Alexander 2011) and State of the Environment Programme for Surface Waters, a Council survey of recreational use (Madarasz-Smith 2010) and a recent NIWA report (Davies-Colley and Ballantine 2010).

STEP 7: WEIGHT THE PRIMARY ATTRIBUTES

The decision was made to remove *origin of users* score from the final significance ranking. The distance travelled to swimming sites in Hawke's Bay is high for many sites. The decision to travel to these sites is usually for more than a swimming experience (it may be for picnicking or bush-walking). *Origin of users* was therefore deemed to introduce bias to swimming sites in remote locations (Appendix 4).

The *level of use* was considered to be the most significant attribute, particularly with regard to Council's monitoring of water quality for contact recreation. The decision was made to give *level of use* double weighting, and to remove *origin of use* from the calculation (although the raw data for this attribute is still presented in Appendix 4 for completeness).

STEP 8: DETERMINE RIVER SITE SIGNIFICANCE (CURRENT STATE)

The spreadsheet was used to sum the indicator threshold scores for each swimming site and sort the sites into descending order (Appendix 4). The Expert Panel closely examined the ranked list of river sites and looked for cut off points in the list, given their knowledge of the sites. A score above 17 looked like the appropriate threshold for regional significance, i.e., the Panel's knowledge of sites suggested that those scoring above 17 were of regional significance and those 17 and below were not. As a result, twelve sites were identified as regionally significant for river swimming. The rivers containing regionally and locally important sites for swimming are shown in Figure 1.

STEP 9: OUTLINE OTHER FACTORS RELEVANT TO THE ASSESSMENT OF SIGNIFICANCE

This step comprises two parts: (1) identification of site characteristics desirable for swimming; and (2) discussion of factors which are not quantifiable but considered relevant to significance assessment (see Appendix 5).

The site characteristics identified as desirable for swimming in the most recent application of RiVAS for river swimming (Tasman District – Booth et al. 2010a) were adopted. In most (but not necessarily all) cases, a 'good' swimming site will have all of these characteristics. A change in any of them may affect the ability to undertake swimming at the site or the perception of its attractiveness to users. See Appendix 5.

Desirable site characteristics include:

1. Public access
2. Flow (velocity)
3. River width
4. Perception of safety
5. Beach

'Degree of scarcity of the experience' was considered to be a factor that could not easily be quantified but was relevant to consideration of significance.

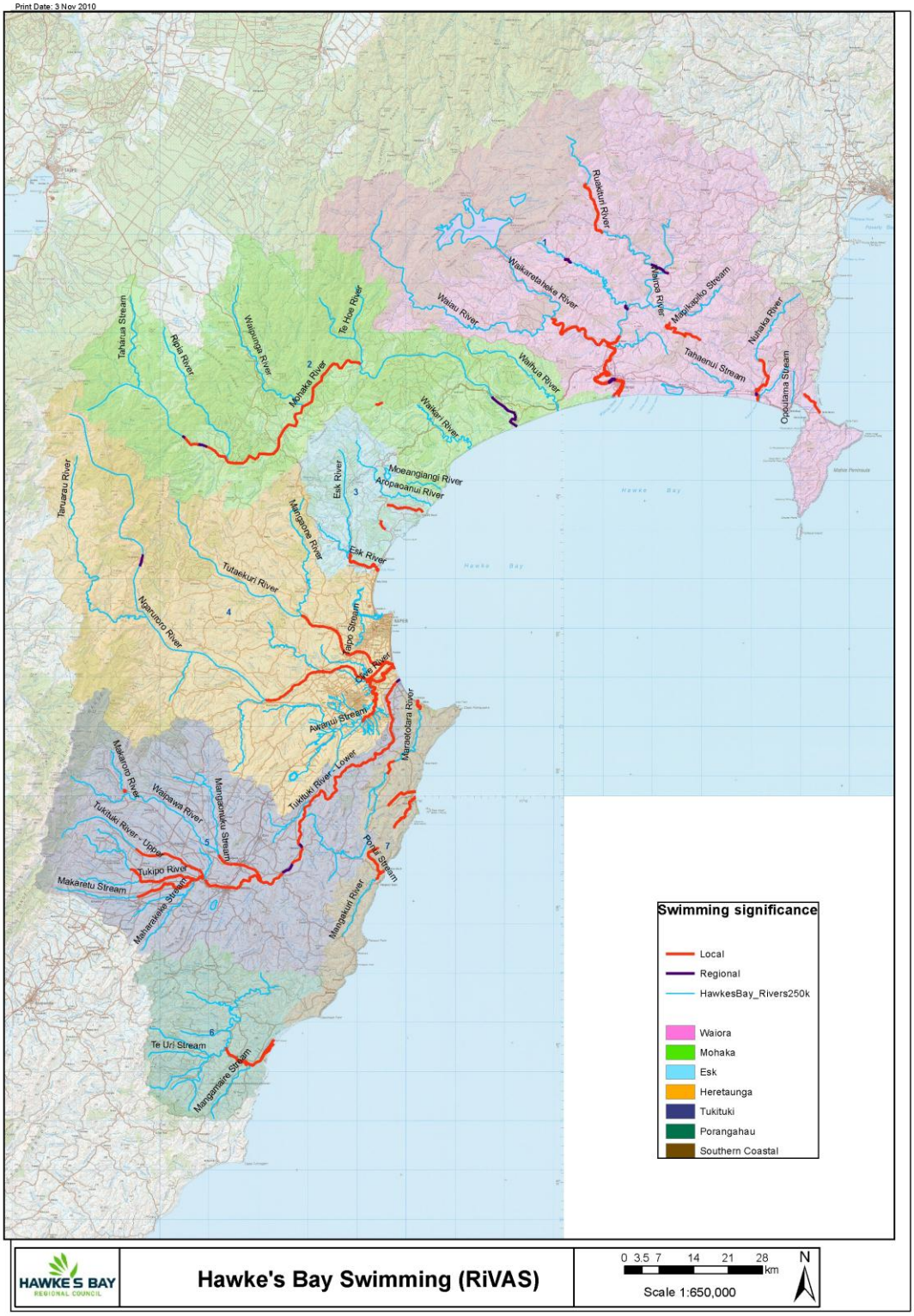

Figure 1: Hawkes Bay swimming rivers mapped according to those containing regionally and locally important swimming sites.

3. APPLICATION OF THE RIVAS+ METHOD: POTENTIAL FUTURE STATE OF RIVERS

STEP 10: IDENTIFY RIVERS AND INTERVENTIONS

The 51 swimming sites were assessed for their potential value to swimming (RiVAS+ assessment - see Appendix 4).

Means by which river conditions may be enhanced for river swimming were discussed and the list of possible interventions was adopted from the most recent application of RiVAS for river swimming (Tasman District – Booth et al. 2010a). See 'Interventions' sheet in Appendix 4.

STEP 11: APPLY INDICATORS AND INDICATOR THRESHOLDS FOR POTENTIAL VALUE

Taking each swimming site in turn, the Expert Panel considered which interventions were relevant to that river (Appendix 4).

The RiVAS+ method calls for the Panel to select the two most important interventions for each river, and for these to be practical and feasible rather than ideal. Although it may not be practical in all locations, it was agreed that adding a toilet to all sites would improve the site's appeal. Following the RiVAS+ method, the Panel identified 'best case' or optimum scenarios and identified 1-2 interventions (plus a toilet) for each river (rather than listing every potential intervention and highlighting the 'best' three). This sped up the assessment, and enabled the workshop to be completed in one day.

Then the Panel considered the net effect of these interventions upon the value of the site to swimming and the new scores were recorded for each attribute (Appendix 4).

It was noted that the means to implement the intervention was best left to the Council to decide, e.g., 'remove litter' could be achieved through staff doing regular clean ups or through a public education campaign.

Discussion identified that factors relevant to the potential assessment were:

- Frequency with which certain interventions were recommended (see Step 13).
- Benefits vs. costs (Council to assess cost at a later date).
- Other factors, e.g., spatial distribution of the sites recommended for enhancement.

Also, it was noted that future testing could assist to identify the most appropriate intervention (e.g., test faecal contamination to identify whether of human or cattle origin).

STEP 12: WEIGHT THE PRIMARY ATTRIBUTES FOR POTENTIAL VALUE

The same weighting criteria were applied to the potential state assessment (RiVAS+) as was used for the current state RiVAS assessment.

STEP 13: DETERMINE RIVER POTENTIAL VALUE

The scores were summed for each river (Appendix 4). The most dramatic shifts were recorded for those sites that scored poorly in their current state – not surprisingly they showed the greatest potential to improve. Ten of the twelve sites which scored 'Low' shifted to 'Moderate'. Many sites increased their overall score by only 1-2 points, often as a result of 'adding' a toilet to service high-use sites. For many of these sites, the change of 1-2 points shifted the significance from 'Moderate' to 'High'. This resulted in a change from 'Local' to 'Regional' significance for many sites if the cut off point remained at sites scoring above 17. It was therefore agreed that the cut off for 'Regional' significance should be altered to sites which scored above 18. All shifts were in a positive direction (sometimes

adverse effects have been evident in RiVAS+ assessments because changing one attribute may have an adverse effect on another attribute).

Assuming successful implementation of the identified interventions, the assessment indicates that eight sites would shift from local significance (in their current state) to regional significance:

- Tukituki @ Black Bridge
- Tutaekuri @ Guppy Rd
- Boundary Stream @ Shine Falls
- Tangoio @ Te Ana Falls
- Waiua at Otai Reserve
- Waikaretaheke
- Tukituki @ Rochfort Rd
- Kopuawhara @ Council Reserve

Interventions most frequently identified as a means to enhance swimming value are given in Table 2.

Table 2: Intervention by the number of sites for which it was recommended
(interventions specific to only one site are not given)

Intervention		No. sites where recommended
9c	Provide toilets	40
7a	Remove/fence out stock	12
7b	Reduce non-point source nutrient pollution, e.g., farm nutrient budgets	10
7d	Reduce sediment input, e.g., forest management practices	9
6c	Remove litter	4
7c	Reduce point source pollution, e.g., mining waste	3
6b	Plant native vegetation	3

4. REVIEW

STEP 14: REVIEW ASSESSMENT PROCESS AND IDENTIFY FUTURE INFORMATION REQUIREMENTS

Few data were available to inform this case study. Desired data are noted in Appendix 6.

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APPENDIX 1: CREDENTIALS OF THE EXPERT PANEL MEMBERS AND ADVISOR

The Expert Panel comprised five members. Their credentials are:

1. Tim Sharp is a Strategic Policy Advisor for the Hawke's Bay Regional Council where he coordinates the RiVAS programme for Council. Tim has an environmental management background, specialising in resource management to assess and support community values. He is a keen swimmer and active user of swimming holes in Hawke's Bay rivers.
2. Anna Madaraz-Smith is a Senior Scientist (Coastal Quality) with the Council and has been the manager of its recreational water quality monitoring programme for the past 8 years. She was on the national working group for the draft cyanobacteria guidelines.
3. Aki Paipper is from the Kohupatiki marae. She has been involved in a river care group and assisted the Council with various freshwater and water quality issues over the years. In particular, Aki offers traditional knowledge about swimming.
4. Jenny Mauger is also from the Kohupatiki marae and works as the tangata whenua liaison person for the Council. She has a background in environmental science.
5. Erin Petuha works for the Hawke's Bay Regional Council in its resource consents area. She provides local knowledge of river swimming, from the perspective of a younger person.

Advisor and facilitator:

1. Dr Kay Booth is an outdoor recreation researcher and planner, and the Director of Lindis Consulting. Kay has been involved in developing the RiVAS tool since its inception in 2007, and has applied RiVAS to recreation values for several regional councils.

APPENDIX 2: ASSESSMENT CRITERIA FOR RIVER SWIMMING (STEPS 2-4) – BLUE FONT INDICATES REVISIONS FROM THIS APPLICATION

ATTRIBUTE CLUSTERS	ATTRIBUTE (primary attributes in bold)	DESCRIPTION OF PRIMARY ATTRIBUTES	INDICATORS	INDICATOR SIGNIFICANCE THRESHOLDS	DATA SOURCES (AND RELIABILITY)
Step 2: Identify attributes Step 3: Select and describe primary attributes		Step 3: Select and describe primary attributes	Step 4: Identify indicators	Step 5: Determine significance thresholds	
ATTRIBUTES ASSOCIATED WITH EXISTING USE					
Social	**Level of use**	High use implies high value. This may not hold true for two reasons: **Remote places**, which offer few encounters with other people, may be highly valued for their wilderness value and the experience of 'having the place to ourselves'. **Crowding** may occur at popular sites, which may turn people away. This may be anticipated and the site not chosen for a swim, or occur on arrival (displaced to another nearby site, if one exists).	Number of swimmers on a peak use day NOTES: Alternative indicators: 1. Maximum number of swimmers at peak time on a peak use day 2. Number of swimmer days p.a.	High (**score: 3**) Medium (**score: 2**) Low (**score: 1**)	Expert Panel estimate (good)
	Travel distance	Origin of users is suggested as an indicator of quality of the recreational experience, based on the assumption that the higher the expected quality of the experience, the greater the distance users will be prepared to travel.	Number of kms travelled by swimmers from previous night's location NOTES: Travel time was considered but distance offers a more standard	High: >30 km (**score: 3**) Med: 10-30 km (**score: 2)** Low: <20 km (**score: 1**) Upper threshold changed from >20kms to >30kms	Expert Panel estimate (poor)

ATTRIBUTE CLUSTERS	ATTRIBUTE (primary attributes in bold)	DESCRIPTION OF PRIMARY ATTRIBUTES	INDICATORS	INDICATOR SIGNIFICANCE THRESHOLDS	DATA SOURCES (AND RELIABILITY)
		A site close to a large population (short travel distance) will receive more use for reasons of convenience (close to home) resulting in a higher level of local use rather than necessarily signifying regional importance.	metric as time introduces the factor of travel style (e.g. walk, car, cycle).		
	Perception of safety	Overall evaluation that accounts for a range of perceptions (e.g. flow, water quality, presence of others). Outcome of swimmers' decision-making can be measured via numbers of swimmers attribute.	**Desirable site characteristic**		
	Other users and uses	This includes other users' demographics, their behaviour and the style of their use (e.g. organised events). The types of people who frequent a site may influence its perceived suitability (e.g. site popular with young males who 'take over the place').			
	Diversity of recreation opportunities	Swimming is often undertaken by groups with a range of activity interests. For example, young children who paddle with their parents, some family members who want to go fishing, others who want to sun bathe and swim to 'cool off'. The diversity of opportunities			

ATTRIBUTE CLUSTERS	ATTRIBUTE (primary attributes in bold)	DESCRIPTION OF PRIMARY ATTRIBUTES	INDICATORS	INDICATOR SIGNIFICANCE THRESHOLDS	DATA SOURCES (AND RELIABILITY)
		available to cater for different group members may therefore increase a site's attractiveness.			
Amenity / managerial setting	**Presence of facilities**	When a site is well used, councils provide facilities (such as toilets). However, the provision of facilities may also encourage use (people go to sites where there are toilets, which means they can plan to stay all day, for example). Since some councils provide in a higher level of facility provision than others, the Expert Panel needs to maintain oversight of these data. Camping indicates significant length of stay and a swimming hole can be well used by local campers. Camping facilities may be provided by different types of provider (public or private). Since some councils have a greater propensity to provide facilities than others, the Expert Panel needs to maintain oversight of these data. NOTES: This attribute does not include freedom camping which can happen almost anywhere	Presence/absence of toilets maintained by the Territorial Authority Presence/absence of camping facilities (e.g. designated camping sites, ablution block, signage, etc) maintained by public or private provider	Camp + toilet (**score: 3**) Toilet only (**score 2**) Absent (**score: 1**)	Council data (excellent) Expert Panel estimate (excellent)

ATTRIBUTE CLUSTERS	ATTRIBUTE (primary attributes in bold)	DESCRIPTION OF PRIMARY ATTRIBUTES	INDICATORS	INDICATOR SIGNIFICANCE THRESHOLDS	DATA SOURCES (AND RELIABILITY)
	Maintenance activities	Some form of council maintenance (e.g. lawn mowing, rubbish collection, weed control) suggests high usage sites.			
	Public access - unrestricted public access; no access charges; easy practical access	Public access to the site and within the site to the water is critical. This attribute is one of the essential elements of swimming sites – without access, no swimming can occur	**Desirable site characteristic**		
	Jump-off points	A high point (e.g. bridge, rope swing) adds to the swimming site - amenity feature			
Aesthetic / scenic	**Perception of scenic attractiveness**	It is expected that there is a positive correlation between perceived scenic attractiveness and swimming amenity. This attribute refers to the integrated set of aesthetic components, many of which are listed as separate attributes in this cluster (see next rows). Ideally a professional landscape assessment would be used or else the perceptions of swimmers. In the absence of these data, Expert Panel estimates were used.	Perception of scenic attractiveness	High (**score: 3**) Medium (**score: 2**) Low (**score: 1**)	Expert Panel estimate (good)
	Degree of naturalness	Amenity feature			

ATTRIBUTE CLUSTERS	ATTRIBUTE (primary attributes in bold)	DESCRIPTION OF PRIMARY ATTRIBUTES	INDICATORS	INDICATOR SIGNIFICANCE THRESHOLDS	DATA SOURCES (AND RELIABILITY)
	Wilderness character	Amenity feature			
	Visual landscape back-drop	Amenity feature			
	Flora and fauna	Amenity feature			
	Open space	Amenity feature			
	Natural features that offer jump-off points (big rock, cliff, etc)	Amenity feature			
	Water temperature	Amenity feature			
	Cleanliness and tidiness	Amenity feature			
Physical river features	**Swimming holes**	The opportunity to dive and play around in deeper water was considered to be an attractive feature – people often talk about 'good swimming holes'	Maximum water depth	High: >3 m (**score: 3**) Medium: 2-3m (**score: 2**) Low: <2 m (**score: 1**)	Expert Panel estimate (good)
	Variable water depth	A flat river bed was considered less attractive for swimming than a variable (shallow + deep) bed profile. A low score is a flat bed with little variability.	Morphological variability	High (**score: 3**) Medium (**score: 2**) Low (**score: 1**)	Expert Panel estimate (good)
	Width of river	A river needs to be wide enough to make it worthwhile for swimming	**Desirable site characteristic**		
	Flow	Velocity <1 m/s, as >1 m/s is too fast	**Desirable site**		

ATTRIBUTE CLUSTERS	ATTRIBUTE (primary attributes in bold)	DESCRIPTION OF PRIMARY ATTRIBUTES	INDICATORS	INDICATOR SIGNIFICANCE THRESHOLDS	DATA SOURCES (AND RELIABILITY)
		for an adult to wade (at depth of 1 m after which point person likely to swim rather than walk)	**characteristic**		
	Consistency of flow	Some swimming holes dry up and are not usable in the peak summer months			
	Hard/soft river bed bottom	Soft river beds are muddy and may be less popular			
	Natural jump-off features (e.g. large rock)	Amenity feature			
	Beach	Somewhere to sit and easy access to the water	**Desirable site characteristic**		
	Pools	Amenity feature			
	Pool/riffle/run sequences	Amenity feature			
Water quality	Rapids	Amenity feature			
	Algae	The presence of blue-green algae (cyanobacteria) presents a public health issue. Draft national guidelines (MfE and MoH, 2009) have been developed – cyanobacteria guideline breaches trigger the posting of public health warnings. Other periphyton (filamentous algae and diatoms) present a nuisance to swimmers and detract from aesthetic appeal (Biggs, 2000) rather than	Compliance with national periphyton guidelines and draft national guidelines for cyanobacteria, i.e.: The maximum cover of visible stream or river bed by periphyton: filamentous algae more than 2 cm long shall not exceed 30%;	**High**: Met guidelines >50% of the time in past year (**score: 3**) **Medium**: Met guidelines 25-50% of the time in past year (**score: 2**) **Low**: Met guidelines <25% of the time in past year (**score: 1**)	Council data available (very good) Expert Panel estimate (fair)

ATTRIBUTE CLUSTERS	ATTRIBUTE (primary attributes in bold)	DESCRIPTION OF PRIMARY ATTRIBUTES	INDICATORS	INDICATOR SIGNIFICANCE THRESHOLDS	DATA SOURCES (AND RELIABILITY)
		present a potential health issue. This attribute encompasses types of algae that relate to a health risk (cyanobacteria) or a nuisance (filamentous algae/diatoms) for swimmers.	diatoms more than 3 mm thick shall not exceed 60%; or cyanobacteria cover shall not exceed 50%		
	Blue-green algae	Covered above – initially separately identified owing to its importance for public health			
	Macrophyton (water weed)	The presence of water weed can be unpleasant for swimmers and may make swimming difficult			
	Water clarity	Users prefer clear water	Compliance with ANZECC (2000) guidelines, i.e.: Horizontal visibility >1.6 m (black disc visibility)	**High**: >3.0 m horizontal visibility when river is below median flow (**score: 3**) **Medium**: 1.6-3.0 m horizontal visibility when river is below median flow (**score: 2**) **Low**: <1.6 m horizontal visibility when river is below median flow (**score: 1**)	Expert Panel estimate (fair) Some Council data available (very good)
	Faecal contaminants	Related to water clarity and flow (data indicate a positive correlation)			
	pH	Acid or alkaline pH may cause skin irritations and make eyes and cuts			

ATTRIBUTE CLUSTERS	ATTRIBUTE (primary attributes in bold)	DESCRIPTION OF PRIMARY ATTRIBUTES	INDICATORS	INDICATOR SIGNIFICANCE THRESHOLDS	DATA SOURCES (AND RELIABILITY)
		sting			
CONTEXTUAL ATTRIBUTES					
Collective value	Site clusters	The proximity of sites to each other may influence site selection, as it provides options (e.g. if one site looks crowded, users can go to a nearby site).			
	Scarcity	Where few swimming sites exist within an area, then each site is more significant			

APPENDIX 3: ASSESSMENT OF INDICATORS BY SMARTA CRITERIA

Indicator	Specific	Measurable	Achievable	Relevant	Timely	Already in use
No. swimmers on a peak use day	Yes	No. swimmers	Requires on-site monitoring	Use implies site valued by user	Data not available (requires monitoring)	Standard recreation metric
No. kms travelled by swimmers from previous night's location	Yes	No. km	Requires user survey to identify previous night location	Large travel distance implies high value	Data not available (requires user survey)	Question been asked in recreation surveys
Presence of facilities (toilets; camp facilities - designated sites, ablution block, signage, etc)	Yes	Toilet and camp facilities present/absent	Data available for Council facilities; non-council facilities known by Panel	Facilities respond to demand/high use	Data available	Data used by councils for other purposes
Perception of scenic attractiveness	Yes	Response to user survey rating scale question; professional assessment by landscape planner	Requires site visit (planner) or else user survey	Likely to influence choice of swimming site	Data not available (but could obtain from site visit – user survey or professional assessment)	Assessments undertaken by landscape planners for other purposes; Question been asked in recreation surveys
Maximum water depth	Yes	Physical measure	Site visit required	Provides swimming hole	Data not available (easy to obtain onsite)	No
Morphological variability	Yes	Physical measure	Site visit required	Provides site conducive to swimming	Data not available (easy to obtain from site visit)	No
Compliance with periphyton and cyanobacteria guidelines	Yes	National water quality measures	Council monitoring programme	Triggers posting of health risk warning and/or nuisance	Data available	Data used by councils for public health warnings
Compliance with horizontal visibility guidelines	Yes	National water quality measure	Council monitoring programme	Likely to influence choice of swimming site	Data available	Data used by councils for other purposes

APPENDIX 4: SIGNIFICANCE ASSESSMENT CALCULATIONS FOR SWIMMING (STEPS 1, 5-8 AND 10-13)

River	Swimming site	Threshold scores - RiVAS (current conditions)								Scoring		Significance	Inter-vention	RiVAS+ threshold scores								Scoring		Significance	Current		Potential		
		Horizontal visibility	Max water depth	Morphological variability	G/lines compliance	Overall rating	Kms from home	No swmrs/peak day	Presence facilities		Weighting			Horizontal visibility	Max water depth	Morphological variability	G/lines compliance	Overall rating	Kms from home	No swmrs/peak day	Presence facilities		Weighting						
		Water clarity	Swimming holes	Variable water depth	Algae	Scenic attrvness	Origin of users	Level of use	Facilities		Level of use*2			Water clarity	Swimming holes	Variable water depth	Algae	Scenic attrvness	Origin of users	Level of use	Facilities		Level of use*2						
		1<1.6m,2=1.6-3m,3>3m	1<2m,2=2-3m,3>3m	1=low, 2=med,3=high	1>50%,2=25-50%,3<25%	1=low,2=mod,3=high	1<10km,2=10-20km,3>20km	1=low,2=med,3=high	1=no,2=toilet only,3=camp+toilet	Sum	Origin of use removed	Significance	See sheet 2 for key	1<1.6m,2=1.6-3m,3>3m	1<2m,2=2-3m,3>3m	1=low, 2=med,3=high	1>50%,2=25-50%,3<25%	1=low,2=mod,3=high	1<10km,2=10-20km,3>20km	1=low,2=med,3=high	1=no,2=toilet only,3=camp+toilet	Sum	Origin of use removed	Significance	**Scores**	**Significance (>17)**	**Scores**	**Shift**	**Significance (>18)**
Maraetotara	Falls	2	3	3	3	3	3	3	1	21	21	H	9c	2	3	3	3	3	3	3	2	22	22	H	21	Regional	22	1	Regional
Mohaka	The Gums parking area, Makahu Rd (TRAMPING)	3	3	3	3	3	3	1	3	22	20	H		3	3	3	3	3	3	1	3	22	20	H	20	Regional	20	0	Regional

Ngarururo	Kuripapango (CAMPING)	3	3	3	3	3	3	1	3	22	20	H		3	3	3	3	3	3	1	3	22	20	H	20	Regional	20	0	Regional
Mohaka	Te Puia Hut (TRAMPING)	3	3	3	3	3	3	1	3	22	20	H		3	3	3	3	3	3	1	3	22	20	H	20	Regional	20	0	Regional
Tukituki	mouth, Haumoana	1	3	3	1	2	1	3	3	17	19	H	7b, 7d	2	3	3	2	2	2	3	3	20	21	H	19	Regional	21	2	Regional
Tukituki	Shag Rock, River Rd	2	2	3	3	2	2	3	1	18	19	H	9c	2	2	3	3	2	2	3	2	19	20	H	19	Regional	20	1	Regional
Mangaaruhe	Mangaaruhe	3	3	3	3	3	2	1	1	19	18	H	9c	3	3	3	3	3	2	2	2	21	21	H	18	Regional	21	3	Regional
Nuhaka	Town bridge	2	2	3	3	2	3	2	2	19	18	H	7a, 7b	2.5	2	3	3	2	3	2	2	19.5	18.5	H	18	Regional	18.5	0.5	Regional
Wairoa	Ski club	1	3	2	3	1	2	3	2	17	18	H	6b, 7d	2	3	2	3	1	2	3	2	18	19	H	18	Regional	19	1	Regional
Tukituki	Patangata south of Bridge	2	2	3	3	3	1	2	1	17	18	H	9c	2	2	3	3	3	1	2	2	18	19	H	18	Regional	19	1	Regional
Mohaka	SH2 Bridge to mouth	3	3	3	3	3	3	1	1	20	18	H	9c	3	3	3	3	3	3	2	2	22	21	H	18	Regional	21	3	Regional
Ruakituri	At village, Te Reinga	3	3	3	3	3	3	1	1	20	18	H	9c	3	3	3	3	3	3	2	2	22	21	H	18	Regional	21	3	Regional
Tukituki	Black Bridge	2	2	3	1	2	2	3	1	16	17	M	7a, 7b, 9c	2	2	3	2	2	2	3	2	18	19	H	17	Local	19	2	Regional
Tukituki	SH2 Bridge	2	2	2	2	2	2	3	1	16	17	M	9c	2	2	2	2	2	2	3	2	17	18	H	17	Local	18	1	Local
Tutaekuri	Guppy Rd	1	2	3	2	2	2	3	1	16	17	M	7a, 9c	2	2	3	2	2	2	3	2	18	19	H	17	Local	19	2	Regional
Waipawa	SH2 Bridge	3	1	2	3	2	1	2	2	16	17	M	7a, 7b	3	1	2	3	2	1	2	2	16	17	M	17	Local	17	0	Local
Boundary Stream	Shine Falls (TRAMPING)	3	2	2	3	3	3	1	1	18	16	M	9c	3	2	2	3	3	3	2	2	20	19	H	16	Local	19	3	Regional
Tangoio	Te Ana Falls	2	2	3	3	3	3	1	1	18	16	M	6c, 9c	2	2	3	3	3	3	2	2	20	19	H	16	Local	19	3	Regional
Waiau	Otai Reserve	2	3	3	3	2	2	1	1	17	16	M	9c	2	3	3	3	2	2	2	2	19	19	H	16	Local	19	3	Regional
Waikaretaheke	Waikaretaheke	3	1	3	3	3	2	1	1	17	16	M	9c	3	1	3	3	3	2	2	2	19	19	H	16	Local	19	3	Regional
Esk	Eskdale Park (Hukarere school)	2	1	2	2	3	2	2	2	16	16	M	7a, 7b	2.5	1	2	2.5	3	2	2	2	17	17	M	16	Local	17	1	Local
Tutaekuri	Vicarage Rd (Puketapu)	2	1	2	2	2	2	3	1	15	16	M	9c	2	1	2	2	2	2	3	2	16	17	M	16	Local	17	1	Local
Tukituki	Angler's access prior Rochfort Rd	1	3	3	1	3	1	2	1	15	16	M	7d, 9c	2	3	3	2	3	1	2	2	18	19	H	16	Local	19	3	Regional
Porangahau	Access from Bridge	2	2	3	2	2	1	2	1	15	16	M	7b, 7d, 9c	2.5	2	3	2.5	2	1	2	2	17	18	H	16	Local	18	2	Local

Kopuawhara	Council reserve (BEACH)	2	2	3	3	3	3	1	1	18	16	M	9c	2	2	3	3	3	3	2	2	20	19	H	16	Local	19	3	Regional
Kairakau	Mangakuri River (BEACH)	2	1	1	3	3	2	1	3	16	15	M	7a, 7b	2.5	1	1	3	3	2	1	3	16.5	15.5	M	15	Local	15.5	0.5	Local
Makaretu Stream	Next to Hereheretau Rd	2	1	3	3	3	2	1	1	16	15	M	9c	2	1	3	3	3	2	2	2	18	18	H	15	Local	18	3	Local
Tukituki	Makaroro under bridge	2	1	2	2	3	2	2	1	15	15	M	9c	2	1	2	2	3	2	2	2	16	16	M	15	Local	16	1	Local
Waimarama	Waingongoro Stream	2	1	2	3	2	1	2	1	14	15	M	9c	2	1	2	3	2	1	2	2	15	16	M	15	Local	16	1	Local
Ngarururo	Chesterhope Bridge	2	1	1	2	2	1	3	1	13	15	M	6c, 7a, 9c	2.5	1	1	2	2	1	3	2	14.5	16.5	M	15	Local	16.5	1.5	Local
Waipataki	Waipatiki Stream (BEACH)	1	1	1	3	3	3	1	3	16	14	M	6b, 7d	2	1	1	3	3	3	1	3	17	15	M	14	Local	15	1	Local
Tukituki	Ingliss Bush	2	2	3	2	2	2	1	1	15	14	M	9c	2	2	3	2	2	2	2	2	17	17	M	14	Local	17	3	Local
Makaretu River	SH2-SH50	3	1	2	2	3	2	1	1	15	14	M	9c	3	1	2	2	3	2	2	2	17	17	M	14	Local	17	3	Local
Porangahau	River Bridge jetty	2	2	1	3	1	2	2	1	14	14	M	7a, 7b, 9c	2.5	2	1	3	1	2	2	2	15.5	15.5	M	14	Local	15.5	1.5	Local
Tukituki	Opp Kahika Res.	1	2	3	1	2	2	2	1	14	14	M	7b, 7d, 9c	2	2	3	2	2	2	2	2	17	17	M	14	Local	17	3	Local
Karamu/Clive	Karewarewa	2	1	2	3	1	2	2	1	14	14	M	9c	2	1	2	3	1	2	2	2	15	15	M	14	Local	15	1	Local
Porangahau	Access from Pah Rd	2	3	2	2	2	1	1	1	14	14	M	7b, 7d, 9c	2.5	3	2	2.5	2	1	2	2	17	18	H	14	Local	18	4	Local
Tukipo	Adeane's Bush	3	2	2	2	2	2	1	1	15	14	M	9c	3	2	2	2	2	2	2	2	17	17	M	14	Local	17	3	Local
Tukituki	Riverland	1	2	3	1	2	1	2	1	13	14	M	7d, 9c	2	2	3	2	2	1	2	2	16	17	M	14	Local	17	3	Local
Tukituki	Walker Rd	2	1	2	2	3	2	1	1	14	13	L	9c	2	1	2	2	3	2	2	2	16	16	M	13	Local	16	3	Local
Ngarururo	Fernhill Bridge	2	1	1	2	2	2	2	1	13	13	L	7a, 9c	2	1	1	2	2	2	2	2	14	14	M	13	Local	14	1	Local
Karamu/Clive	Pakipaki (Awanui Stream)	2	1	1	2	2	1	2	1	12	13	L	7d, 9c	2.5	1	1	2.5	2	1	2	2	14	15	M	13	Local	15	2	Local
Tangoio	Te Ngarue Stream at SH2	1	1	1	2	2	3	2	1	13	12	L	6c, 9c	1	1	1	2	2	3	2	2	14	13	L	12	Local	13	1	Local
Maraetotara	Lagoon	1	1	2	2	1	1	2	1	11	12	L	9b, 9c	1	1	2	2	1	1	2	2	12	13	L	12	Local	13	1	Local
Ngarururo	Carrick Rd entrance	2	1	1	2	1	1	2	1	11	12	L	6c, 7a, 9c	2.5	1	1	2.5	1	1	2	2	13	14	M	12	Local	14	2	Local
Esk	Ellis Wallace Rd	2	1	1	2	2	2	1	1	12	11	L	9c	2	1	1	2	2	2	2	2	14	14	M	11	Local	14	3	Local

Tukituki	Tenant Rd	2	1	3	1	1	1	1	1	11	11	L	7d, 9c	2.5	1	3	2	1	1	2	2	14.5	15.5	M	11	Local	15.5	4.5	Local
Maraetotara	Bill Shaws Te Awanga	3	1	1	1	2	1	1	1	11	11	L	9c	3	1	1	1	2	1	2	2	13	14	M	11	Local	14	3	Local
Karamu/Clive	Kohupatiki to Boatramp	1	1	2	1	2	0	0	2	9	9	L	6b, 7c	2	1	2	2	2.5	2	2	2	15.5	15.5	M	9	Local	15.5	6.5	Local
Karamu/Clive	Pakiaka to Kohupatiki	1	2	1	1	2	0	0	1	8	8	L	7a, 7c, 9c	2	2	1	2	2.5	1	2	2	14.5	15.5	M	8	Local	15.5	7.5	Local
Karamu/Clive	Havelock Nth to Pakiaka	1	1	1	1	2	0	0	1	7	7	L	7a, 7c, 9c	2	1	1	2	2.5	1	2	2	13.5	14.5	M	7	Local	14.5	7.5	Local

Colour Code Key

Significance thresholds (highlighted columns)

Green	High = National
Blue	Moderate = Regional
Yellow	Low = Local

Misc (highlighted rivers)

Pink	Level of use score adjusted to reflect site includes other attractions in ().

RiVAS+ Interventions

Orange	Score changed by proposed interventions (RiVAS+)
Green	Positive influence on attribute but only minor shift in value - counted as an increase of 0.5 (RiVAS+)

Black numbers	Data supported
Red numbers	No data

Notes:

Algae: assessment includes macrophytes which is more of a problem than algae to swimmers in many areas

Interventions:

9c, Adding a toilet may not be practical in some sites;

7d, Afforestation would benefit the smaller tributaries (by reducing sedimentation, clarity should improve) but the higher order streams would require a catchment wide approach. Hence a positive influence but minor shift in value

List of Interventions

INTERVENTIONS

1. Enhance access

a. Helicopter access
b. Vehicle access
c. Boat access
d. Foot access

2. Enhance flow

a. Increase minimum
b. Stabilise (around targeted specific flow)
c. More natural variability
d. Restore flood flows
e. Transfer water between catchments

3. Improve bed & in-stream habitat

a. Maintain channel works (e.g. groynes, other structures) that enhance worth
b. Remove channel works (groynes, stop banks etc) that detract from worth
c. Control weeds (in-stream, including active river bed) to enhance worth
d. Remove hazards (e.g., wire, trees, old structures, forestry slash)
e. Leave woody debris in river that enhance worth

4. Remove or mitigate fish barriers

a. Culverts
b. Dams
c. Flood gates
d. Chemical

5. Set back stopbanks

6. Improve riparian habitat

a. Weed & pest control
b. Native revegetation
c. Remove litter

7. Enhance water quality

a. Remove/fence out stock
b. Reduce non-point source nutrient pollution (e.g., farm nutrient budgets)
c. Reduce point source pollution (e.g., mining waste)
d. Reduce sediment input (e.g., forest management practices)

8. Stock with fish

9. Provide amenities

a. Boat launching facilities
b. Car parking
c. Toilets
d. Storage facilities (for kayaks etc)
e. Artificial hydraulic feature (for kayakers, swimmers, anglers)
i) Slalom course
ii) Play wave
iii) Swimming hole
f. Interpretive signage
g. Riverside track (for access)

10. Construct water storage

a. In-river
b. Out-of-river

11. Develop a run-of-the-river diversion

12. Provide telemetered flow monitoring (& communicate readings)

APPENDIX 5: OTHER FACTORS RELEVANT TO THE ASSESSMENT OF SIGNIFICANCE FOR SWIMMING (STEP 9)

Desirable site characteristics for swimming
Public access The public must be able to access the site. Access for vehicles is important for most sites and includes space for parking (which may be informal). It was noted that access to most swimming sites is free of charge in New Zealand and this is expected by New Zealanders.
Flow (velocity) The water should be flowing (not stagnant) and able to be waded (<1 m/s at 1 m depth).
River width A river that is too narrow is unlikely to attract swimmers - a width of approximately >5 m was suggested.
Perception of safety Swimmers are unlikely to use a site they consider too risky.
Beach Ideally, the shore provides somewhere to sit and enables easy access to the water.
Other factors
Degree of scarcity of the experience Where few alternative (substitute) sites exist that suit swimming, then the degree of scarcity is high (and vice versa). This places greater significance upon sites. Conversely, where sites exist in close proximity, this may influence site selection as it provides options (e.g. if one site looks crowded, users can go to a nearby site).

APPENDIX 6: Future data requirements for swimming (Step 14)

Data need
User monitoring at swimming sites on peak use days – numbers of users
Professional assessment of scenic attractiveness by landscape planner
User surveys at swimming sites (home location; perception of scenic attractiveness; use by different ethnic groups; satisfaction with visit)
Population-based survey (in conjunction with other recreation data collection) - to enable calculation of swimmer/days + evaluation of the overall importance of different sites for swimming