Appendix 30: Report Cards

1. Introduction

This paper provides a full set of sample Report Cards for the aspirations outlined in Section 4. Report Cards summarise results of monitoring and evaluation to track the progress of restoration (see Appendix 29: Monitoring and Evaluation). They use both 'action' indicators and 'state' indicators. As explained in Section 8, state indicators describe the health and wellbeing of the Waikato River, and can be scored from monitoring data or predicted from models. State indicators are the ultimate indicators of restoration but, as explained in Section 8, they are affected by time lags and may be subject to high natural variability, making trends difficult to detect for many years. Action indicators describe how far a particular restoration action has been carried out, and complement state indicators especially early in restoration. Action indicators can also be used to audit actions.

When carrying out restoration, it is important that monitoring builds on existing long-term records where appropriate (e.g., Environment Waikato's water quality and ecological monitoring networks and their riparian fencing/vegetation monitoring, see Section 1.4 in Appendix 29: Monitoring and Evaluation). Some new monitoring will need to be put in place, including describing the baseline state for health and wellbeing. Any new monitoring needs to be put in place as soon as possible, in order to quantify the baseline (viz., the starting point for restoration) where this has not already been done.

In the following Report Cards, state indicators have been used where possible, along with action indicators. At this point in time, data is not available to score some state indicators, so action indicators are used as surrogates (as described in Section 8.2.2). Environment Waikato has also prepared Report Cards for many indicators, and the Study team has drawn on their methology where relevant.

Some state indicators still need development and could not be scored at this time. Exceptions were most water quality indicators and some ecological indicators, where there is monitoring data. If a proposed indicator could not be scored, it was still listed in the example Report Cards as a 'placeholder'. Indicators for the health and wellbeing of the Waikato River still need to be developed for reporting using Cultural Health Indices (CHI) (see Appendix 29: Monitoring and evaluation). As discussed in Section 8, the five river iwi (tribes) may wish to identify the scope of the Cultural Health Indices that they want to see developed, and the type of indicators to be included, that are consistent with their aspirations. Once developed, the CHI may replace or incorporate indicators or Report Cards outlined in this appendix.

As Report Cards evolve, with experience and ongoing restoration, a subset of the most useful indicators will emerge. Guidance for developing indicators is given in Appendix 29: Monitoring and evaluation.

The targets for each indicator in these sample Report Cards are derived from information detailed in the relevant preceding appendices, e.g., targets for the Fisheries and Kai – Whitebait Report Card are derived from data in Appendix 6: Whitebait.

The Report Cards can be prepared for any part of the Waikato River. In the following examples, the Study team have used monitoring data and predicted water quality for the Waikato River near Horotiu in the middle Waikato, except where this was inappropriate (e.g., shallow lakes). Note that regional and national prosperity aspiration indicators (Aspirations 14 and 15) are not scored.

These sample Report Cards illustrate a way forward for the Waikato River Authority. They use actual data where it is available and use the indicators that the Study team believe are suitable. Thus they are 'real' Report Cards. Nevertheless, the Waikato River Authority may wish to review each Report Card and refine them to best meet their objectives.

2. Report Cards

The sample Report Cards provided below are listed in the following order:

Table	Report Card
1A	Fisheries and Kai - Whitebait
1B	Fisheries and Kai - Tuna
2	Taonga Species
3A	Ecological Integrity - Lakes
3B	Ecological Integrity – Riverine Habitat
4	Aesthetics
5	Swimming and boating
6	Human Health
7	Water Quality
8	Water Allocation
9	Significant and Historic Sites
10	Access
11	Spiritual Values
12	Holism
13	Engagement

Table 1A: Fisheries and Kai - Whitebait Report Card				
	Measure or indicator	**Target**	**Current**	**Score**
Action indicators (see Appendix 6: Whitebait)				
1	Adult iinanga prime stream habitat (km).	800	350	D
2	Iinanga spawning habitat (bank length km).	20	10.5	C-
3	Weeds managed appropriately in low-land drains to enhance adult iinanga habitat (km).	6,400	1,800	E
4	Number of impassable tidegates made fish-friendly in prime potential habitat area at Aka Aka (number).	23[a]	0	E
5	Number of road culverts passable to migrant iinanga (number).	180	70	D
6	Number of farm culverts passable to migrant iinanga (number).	5,000	2,000	D
7	Total stream length of potentially prime habitat for banded kookopu with restored riparian vegetation (km).	310	250	B
8	Number of farm culverts passable to migrant banded kookopu (number).	4,000	2,560	C
9	Restore shallow lake habitat (see Ecological integrity – lakes).	2 large riverine lakes	Very poor habitat	E
10	Whitebait habitat score (weighted summary of above).	See above	See above	D-
11	The impact of pest fish on juvenile whitebait is reduced.	Research completed	Research underway	D
12	All aspects of the whitebait fishery come under the control of a single regulatory agency.	Legislation enacted	Several agencies	E

Table 1A: (cont.) Fisheries and Kai - Whitebait Report Card					
	Measure or indicator	**Target**		**Current**	**Score**
State indicators				**Current**	**Future**
13	For individual fishers, average catch per unit effort.	20g/hr	2g/hr	D	B
14	Total catch.	TBD	TBD	TBD	TBD
15	Water clarity suitability (measured by ariari board, m).	1	0.6[b]	C	A
16	Abundance restored to allow marae to provide locally caught whitebait (number of events).	20[c]	0	E [c]	B[c]
17	Access to traditional fishing sites.	Iwi[d]	D[c]	D[c]	B[c]
18	A measure of activities associated with knowledge transfer.	Iwi[d]	Iwi[d]	Iwi[d]	Iwi[d]

For action indicators, the current score only is given because all actions should score 'A' if completed successfully.
Grey text indicates best professional judgement.
TBD = to be developed.
[a]Total number, some may already be partially passable.
[b]Measured at Tuakau.
[c] Strictly speaking these can only be scored by river iwi, but tentative scores were given by the Study team based on feedback from the consultation hui.
[d]Iwi – these can only be scored by river iwi. However, actions recommended for Engagement (see Section 5) include that every year two workshops be conducted for each river iwi on restoration methods including traditional fisheries.

Table 1B: Fisheries and Kai - Tuna Report Card					
	Measure or indicator	**Target**	**Current**	**Score**	
Action indicators (see Appendix 5: Tuna)					
1	Creation of tuna pond habitat (ha).	200	0	E	
2	Creation of tuna wetlands habitat (ha).	500	0	E	
3	Weeds managed appropriately in lowland drains to enhance tuna habitat (km).	6,400	1,800	C	
4	Continue existing elver transfer (number).	2,000,000	2,000,000	A	
5	On-growing transferred elvers (number).	800,000	0	E	
6	Fish-friendly pump stations (number).	63	0	E	
7	Fisheries legislation on minimum and maximum sizes.	Amended	Not	E	
8	Create reserves in restored Lake Whangapee and <3rd order streams.	Amended	Not	E	
9	The tuna habitat in the Waikato River catchment is doubled (ha).	5,000	2,500	C	
State indicators				**Current**	**Future**
10	Total catch.	200	100	C	A
11	Abundance restored to allow marae to provide tuna (tonnes).	40	10	D[a]	A[a]
12	Access to traditional fishing sites and/or ability to implement and enforce local-based management measures such as raahui.	Iwi[b]	Iwi[b]	Iwi[b]	Iwi[b]
13	Iwi satisfaction with quality and quantity.	Iwi[b]	D[a]	D[a]	B[a]
14	A measure of activities associated with knowledge transfer.	Iwi[b]	Iwi[b]	Iwi[b]	Iwi[b]

For action indicators, the current score only is given because all actions should score 'A' if completed successfully.

Grey text indicates best professional judgement.

TBD = to be developed.

[a]Strictly these can only be scored by river iwi, but tentative scores were given by the Study team based on feedback from the consultation hui.

[b]Iwi – these can only be scored by river iwi. However, actions recommended for Engagement (see Section 5) include that every year two workshops be conducted for each river iwi on restoration methods including traditional fisheries.

Table 2: Taonga Species Report Card					
	Measure or indicator	**Target**	**Current**	**Score**	
Action indicators					
1	Tuna habitat (see Tuna).	See Tuna.	Fair	C	
2	Whitebait habitat (see Whitebait).	See Whitebait.	Fair	D-	
3	Proportion stream length with RMC score ≥4 weighted for stream size (%).[a]	85	45	C	
4	Knowledge of causes of the decline in kooura, kaaeo and piiharau and restoration actions.	Research projects including marae-based monitoring.	Some existing programs.	D	
5	Knowledge of successfully rearing and reintroducing kooaro and giant kookopu.	Research being done.	Some existing programs.	C	
State indicators				**Current**	**Future**
6	Whitebait catch.	TBD	TBD		
7	Tuna catch.	200	100	C	A
8	Kooura numbers, biomass and distribution (tau kooura).	TBD	TBD	TBD	TBD
9	Kaaeo density in shallow lakes and Waikato main stem (aerial density).	TBD	TBD	TBD	TBD
10	Piiharau occurrence and size distribution (occurrence/size).	TBD	TBD	TBD	TBD
11	Kooaro occurrence and size distribution in upper Waikato streams (occurrence/size).	TBD	TBD	TBD	TBD
12	Giant kookopu occurrence and size distribution in urban streams (occurrence/size).	TBD	TBD	TBD	TBD
13	Native bird surveys (aerial density).	TBD	TBD	TBD	TBD
14	Plant species of traditional significant to iwi (cultural plant index in riparian/wetlands).[a]	Correct mix of plants (to be developed by iwi).	TBD	D	
15	Plant species as habitat and food resources for taonga species (habitat plant index in riparian/wetlands).[a]	Correct mix of plants (to be developed by iwi).	TBD	D	

Grey text indicates best professional judgement.
TBD = to be developed.
For action indicators, the current score only is given because all actions should score 'A' if completed successfully.
[a]Also a state indicator.

Table 3A: Ecological Integrity - Lakes Report Card				
	Measure or indicator[a]	**Target**	**Current**	**Score**
Action and state indicators (see Appendix 12: Shallow lakes)				
2 of the 4 dune lakes (data used from Lake Otamatearoa)				
1	Proportion lake perimeter with RMC score ≥ 4 (%).	90	50	C
2	Submerged plant Index (LakeSPI[1]).	75	18	D
3	Emergent plant index.	TBD	No data.	
4	Lake Trophic Status (TLI[2]).	Mesotrophic	Mesotrophic	A
5	Water clarity (m).	1.6	~3	A
6	Dissolved oxygen (% saturation).	80	Unknown	B
7	Pest fish (CPUE[b]).	Goldfish only.	Goldfish only.	A
8	Community satisfaction with access and use (social survey).	TBD	TBD	TBD
4 of 35 peat lakes (data used from degraded peat lakes)				
1	Proportion lake perimeter with RMC score ≥ 4 (%).	90	30	D
2	Submerged plant Index (LakeSPI).	75	0	E
3	Emergent plant index.	TBD	No data.	E
4	Lake Trophic Status (TLI).	Mesotrophic	Super- and hypertrophic.	E
5	Water clarity (m).	1.6	<0.4	E
6	Dissolved oxygen (% saturation).	80	Unknown	B
7	Pest fish (CPUE[b]).	Eliminate	Variable	D
8	Community satisfaction with access and use.	TBD	TBD	D
9	Catchment nutrient inputs (loads).	TBD	TBD	E
10	Internal lake nutrients inputs (loads).	TBD	TBD	E
11	Water depth (m).	TBD	TBD	D[c]

[1] http://lakespi.niwa.co.nz/index.do
[2] http://www.mfe.govt.nz/withyou/funding/smf/results/5090_nzlm_protocol_complete_text.pdf

Table 3A: (cont.) Ecological Integrity - Lakes Report Card				
	Measure or indicator[a]	**Target**	**Current**	**Score**
2 of 3 large riverine lakes (data used from Lake Whangapee)				
1	Proportion lake perimeter with RMC score ≥ 4 (%).	85	10	E
2	Native submerged vegetation cover.	75	0	E
3	Emergent plant index.	TBD	0	E
4	Lake Trophic Status (TLI).	Mesotrophic	Super- and hypertrophic.	E
5	Water clarity (m).	1.6	Highly turbid.	E
6	Dissolved oxygen (% saturation).	80	Unknown	B
7	Pest fish (CPUE[b]).	Sustainable numbers (TBD).	Prolific	E
8	Community satisfaction with access and use (social survey).	TBD	TBD	E
9	Catchment nutrient inputs (loads).	TBD	TBD	E
10	Internal lake nutrients inputs (loads).	TBD	TBD	E
Lake Ohakurii				
1	Proportion lake perimeter with RMC score ≥ 4 weighted for stream size (proportion).	0.85	0.25	D
2	Invasive Impact Index (part of Lake SPI).	60	96	E
4	Lake Trophic Status (TLI).	Oligotrophic	Mesotrophic	C
9	Nutrient inputs (loads).	TBD	TBD	D
11	Internal lake nutrients inputs (loads).	TBD	TBD	E

Grey text indicates best professional judgement.
TBD = to be developed.
[a]For additional maatauranga Maaori indicators see Taonga Species Report Card.
[b]CPUE = catch per unit effort.

Table 3B: Ecological Integrity - Riverine Report Card					
	Measure or indicator	**Target**	**Current**	**Score**	
Action indicators					
1	Tuna habitat (see Tuna habitat score[a]).	See Tuna.	-	C	
2	Whitebait habitat (see Whitebait habitat score[a]).	See Whitebait.	-	D-	
3	Proportion stream length with RMC score ≥4 weighted for stream size (%).	85	45	C	
State indicators				**Current**	**Future**
5	Turbidity (NTU).	5	2.7	A	A
6	Dissolved oxygen (% saturation).	80%	98%	A	A
7	Temperature (^{o}C).	20	21.8[c]	A	A
8	Periphyton cover in tributaries (%).	TBD	TBD	TBD	TBD
9	Shade in tributaries.	TBD	TBD	TBD	TBD
10	Macrophyte cover and type.	TBD	TBD	TBD	TBD
11	Sediment composition.	TBD	TBD	TBD	TBD
12	Algal blooms (chlorophyll µg/L).	10	16	B	A
13	Satisfaction of taangata whenua of the range of suitable habitat in river and along riverbank (e.g., shelter, tuna burrows covered).	TBD	TBD	TBD	TBD
14	Ecosystem health (macroinvertebrate indices).	Satisfactory		D	A
15	Fish biodiversity.	2.8	2.2	C	B

Grey text indicates best professional judgement.
TBD = to be developed.
For action indicators, the current score only is given because all actions should score 'A' if completed successfully.
[a]Tuna and whitebait habitat restoration are used as indicators of restoration of riverine and associated wetland habitat (but not shallow lakes) in general.
[c]Maximum temperature at Horotiu in 2008.

Table 4: Aesthetics Report Card					
	Measure or indicator[a]	**Target**	**Current**	**Score**	
State indicators[a]				**Current**	**Finish**
1	Riparian vegetation - proportion stream length with RMC score ≥ 4 weighted for stream size (%).[b]	85	45	C	A-
2	Colour of water (change in Munsell colour units)[c].	<10	16.3	C-	B-
3	Clarity of water (m).	1.6	1.28	B	A
4	Sediment composition.	TBD	TBD	TBD	TBD
5	Community satisfaction with appearance of river.	TBD	TBD	TBD	TBD
6	Rubbish.	TBD	TBD	TBD	TBD

TBD = to be developed.

[a]The indicators for aesthetics are all state indicators except for one which is both an action and state indicator. Here the efficacy of the priority actions: fencing, restricting stock access, planting and bank protection, are assessed by their effects on riparian aesthetics, water colour and clarity, sediment muddiness, community satisfaction and rubbish, but the actions themselves are described and assessed in the Water Quality Report Card.

[b] See Appendix 11: Riparian aesthetics.

[c] From predicted 1920s colour.

Table 5: Swimming and Boating Report Card					
	Measure or indicator	**Target**	**Current**	**Score**	
Action indicators					
1	Strategic Access, Boating and Swimming Plan (completion).	Completed	Some policies and rules.	C	
2	Strategic Access, Boating and Swimming Plan (implemented).	Implemented	Some by-laws in place.	D	
3	Snags removed at strategic locations.	10	Some removal.	D	
4	Aquatic weeds (sites controlled).	40	2	D	
5	Satisfactory flows for regattas (agreements in place).	Agreements	Some agreements.	C	
State indicators[3]				**Current**	**Future**
7	*E. coli* (numbers per ml).	<126	82	A	A
8	Clarity (m).	1.6	1.28	B	A
9	Toxic algal blooms (chlorophyll concentration µg/L).	10	16	C-	A
10	Duck itch (survey of parasites at weed control sites).	TBD	TBD	TBD	TBD
11	Satisfaction in relation to waka ama/waka taua with (a) flow levels (b) enter and exit water safely (c) level of weed/algae present (d) water quality.	TBD	TBD	TBD	TBD
12	Satisfaction with river iwi with ability to use preferred skills, practices and methods when interacting with the river.	TBD	TBD	TBD	TBD
13	Surveys of recreational activity and satisfaction.	TBD	TBD	TBD	TBD

TBD = to be developed.

For action indicators, the current score only is given because all actions should score 'A' if completed successfully.

[3] Median (*E. coli*) or mean (clarity and chlorophyll a) values at baseflow.

Table 6: Human Health Report Card					
	Measure or indicator	**Target**	**Current**	**Score**	
Action indicators					
1	No sewage discharges to water (number).	0	30	E	
2	Duck itch (sites weeds controlled).	40	2	D	
3	Streams fenced on dairy to exclude all livestock and native buffers established (%).	100	Unknown	TBD	
4	Streams >= 3rd order fenced on sheep and beef to exclude all livestock and native buffers established (%).	100	Unknown	TBD	
5	Septic tanks (cleaning frequency).	2–3 years	2–6 years	C	
6	Marae with treated water (number).	67	0	E	
7	Proportion geothermal fluids discharged at Wairaakei(%).	0	~50	C	
8	Food basket health risk.	Food advisory	TBD	TBD	
9	Arsenic release risk.	No significant release.	TBD	TBD	
State indicators				**Current**	**Future**
10	*E. coli* (numbers per ml).	126	82	A	A
11	Toxic algal blooms (chlorophyll µg/L).	10	16	B	A
12	Food basket health risk (mercury concentrations in food).	Survey data.	TBD	TBD	TBD
13	Hg in hair samples in the river iwi.	TBD	TBD	TBD	TBD
14	Food basket health risk (arsenic concentrations in food).	Survey data.	TBD	TBD	TBD
15	Arsenic release risk (arsenic in hyperlimnion µg/L).	TBD	TBD	TBD	TBD
16	Arsenic release risk (DO in hypolimnion of hydro lakes).	5	TBD	TBD	TBD
17	Arsenic risk (arsenic in water µg/L).	11	35	D	A
18	Duck itch (survey of parasites at weed control sites).	No parasites.	TBD	TBD	TBD
19	Iwi satisfaction with food basket health risk (social survey).	TBD	TBD	TBD	TBD

Grey text indicates best professional judgement.
TBD = to be developed.

Table 7: Water Quality Report Card					
	Measure or indicator	**Target**	**Current**	**Score**	
Action indicators					
1	Streams fenced to exclude cattle and banks stabilised (proportion %).	100	22[a]	D+	
2	Streams fenced on dairy to exclude all livestock and native buffers established (%).	100	Unknown	TBD	
3	Streams >= 3rd order fenced on sheep and beef to exclude all livestock and native buffers established (%).	100	Unknown	TBD	
4	Proportion of farm area where P fertiliser optimised to soil tests (%).	100	Unknown	TBD	
5	Proportion of dairy farm area using nitrification inhibitors (%).	100	Unknown	TBD	
6	Proportion of dairy farm area where nitrogen fertiliser is not applied during winter (%).	100	Unknown	TBD	
7	Proportion of dairy farm laneways which drain to streams diverted (%).	100	Unknown	TBD	
8	Proportion of run-off from dairy farms routed through ≥1% wetlands.	100	Unknown	TBD	
9	Proportion of treated sewage discharges that have advanced nutrient (P) and pathogen removal (%).	100	TBD	TBD	
State indicators				**Current**	**Future[b]**
10	TP (µg/L N).	500	400	A	A
11	TN (µg/L P).	35	50	B	A
12	Chlorophyll (µg/L).	10	16	B	A
13	Colour (Munsell colour change, Munsell units).	10	16	C	A
14	Turbidity (NTU).	5	2.7	A	A
15	Community satisfaction with water quality (social survey).	TBD	TBD	TBD	TBD

TBD = to be developed.
[a]Storey (2010).
[b]Predicted by the Waikato Catchment Model (see Appendix 13: Water quality).

Table 8: Water Allocation Report Card				
	Measure or indicator	**Target**	**Current**	**Score**
Action indicators				
1	Holism, ecological effects, tangata whenua values, cumulative effects, assimilative capacity, efficiency.	Variations in RPV6 ratified.	Not ratified.	E
2	Water quality targets are met under reduced flows (concentrations).	Targets are met for TP, TN, *E. coli*, clarity and colour.	Not ratified.	E
3	Effects of land use change and riparian management impacts on allocable flows.	Land use change effects on water yield have been considered when setting environmental flows.	Not taken into account.	E
State indicators (preliminary suggestions only)[a]			**Current**	**Finish**
4	Water take plans all optimised to efficient water use.	TBD	TBD	TBD
5	Nutrient plans developed for all irrigation of crops and farmland.	TBD	TBD	TBD
6	Taangata whenua values have been considered in all consents (e.g., proportion of time flow within prescribed ecological and iwi-specific range).	TBD	TBD	TBD

TBD = to be developed.

[a]Choice of indicators should wait until the Regional Plan Variation 6 is finalised.

Table 9: Significant and Historic Sites Report Card					
	Measure or indicator	**Target**	**Current**	**Score**	
Action indicators					
1	Waahi Tapu and Significant Sites Management Plan (completion).	Plan	LA plans.	C	
2	Joint Management Agreements between iwi and LAs (completion).	Significant and historic sites included in JMAs.	None signed.	C	
3	Appropriate signage (percent completion).	Where it is appropriate and in Plan.	0%	D	
4	Restoration at high priority sites identified in the Management Plan (percentage completion).	Percentage completion.	0%	D	
State indicators				**Current**	**Finish**
5	The community understands the historical and cultural associations of sites with the Waikato River (social surveys).	TBD	TBD	TBD	TBD
6	Iwi/community are satisfied that significant sites are protected (and where appropriate) recognised.	TBD	TBD	TBD	TBD
7	Iwi satisfied that valued features of key sites/river reaches are protected.	TBD	TBD	TBD	TBD

Grey text indicates best professional judgement.
TBD = to be developed.

Table 10: Access Report Card					
	Measure or indicator	**Target**	**Current**	**Score**	
Action indicators					
1	Strategic Access Plan is completed for the Waikato region covering access to the Waikato River, legal impediments, including riparian reserves, access and use for boating, footpaths and cycleways, and riparian vegetation.	Plan completed.	Local district plans.	C	
2	Access along, the banks of the Waikato River and its tributaries is improved and thereby uses for recreational purposes such as walking and cycling increased.	Various.	Access excellent in places, poor in others.	C	
3	Access is improved to historic sites, collection sites for kai and cultural materials, and to other sites of cultural significance where river iwi so decide.	Footpaths-some private, some public.	Access excellent in places, poor in others.	D	
4	Access to and from the Waikato River is improved by adding to the existing number of reserves and boat ramps, or improving existing facilities, thereby improving and increasing use for boat launching, swimming and leisure activities.	Works completed.	Access excellent in places, poor in others.	C	
State indicators				**Current**	**Finish**
5	Proportion of main stem Waikato and Waipa with walkways and cycle ways.	TBD	TBD	TBD	TBD
6	Community satisfied with access (social survey).	TBD	TBD	TBD	TBD

Grey text indicates best professional judgement.
TBD = to be developed.

Table 11: Spiritual Values Report Card					
	Measure or indicator	**Target**	**Current**	**Score**	
State indicators[a]				**Current**	**Future**
1	The relationships of iwi, their culture and traditions with the Waikato River which are taonga to them, and integral to their tribal identities (social survey).	Recognised and provided for.	TBD	TBD	TBD
2	The relationships of the wider Waikato community, their culture and traditions with the Waikato River (social survey).	Recognised and provided for.	TBD	TBD	TBD
3	All statutory plans recognise and provide for iwi and wider Waikato community economic, social, cultural and spiritual relationships with the Waikato River.	All plans.	TBD	TBD	TBD

TBD = to be developed.

[a]Spiritual Values are mostly addressed through meeting other aspirations.

Table 12: Holism Report Card			
	Measure or indicator	**Target**	**Score**
Action indicators[a]			
1	Precautionary principle in all plans, policies and decision making.	Plans, policies and rules have been audited and changed if necessary so that decision making is guided by the precautionary principle.	C
2	Plans, policies and rules take into account cumulative effects including multiple stressors.	Technical methods have been developed and adopted. Plans, policies and rules have been audited and changed if necessary to guide decision making.	D
3	Plans and policies take into account cultural, spiritual, social and economic relationships of iwi and wider community with the Waikato River.	Plans have been audited and changed if necessary.	B
4	Decision making is guided by effective national policy and guidelines.	Effective national policy and guidelines are in place.	D
5	An integrated statutory management plan for the Waikato River has been implemented that encompasses physical, chemical, biological, social, economic, cultural and historic matters, at regional, sub-catchment and farm scale.	Plans have been audited and changed if necessary.	E
6	Co-management agreements have been established between iwi and local authorities.	Co-management agreements established.	B
7	The methods used by local authorities are standardised.	The same procedures, guidelines and standards are used by local authorities where possible.	B
8	Actions to restore the Waikato River are being coordinated through the development and implementation of non-statutory management plans.	Plans have been developed (see Boating and swimming, etc.).	D
9	Joint industry-community accords have been established.	Accords established.	D

Grey text indicates best professional judgement.
TBD = to be developed.
[a]In the Holism Report Card, all the indicators are both 'action' and 'state' indicators.

Table 13: Engagement Report Card			
	Measure or indicator	**Target**	**Score**
Action indicators			
1	Representatives from each iwi have completed training course for Commissioners (number trained).	2 per iwi per year.	D-
2	Commissioner-run workshops and group training sessions for each iwi (number).	1 per iwi per 2 years.	E
3	Waikato River focused public education centres.	Wanaanga established.	E
4	Training workshops on restoration methods including riparian fencing and planting, monitoring, traditional fisheries (number).	2 per iwi per year.	C
5	Financial support and resources to coordinators working with iwi and community groups to facilitate better integration of community-based restoration and monitoring initiatives.	Coordinators supported.	C-
6	Repository of equipment that can be used by iwi and community groups for monitoring the progress of restoration.	Equipment available.	D
7	A centralised database and auditing system for monitoring data.	Iwi and centralised databases established, audited and available.	D
8	Culturally appropriate monitoring tools.	Available for use by iwi.	E
9	Partnerships between Waikato River Authority, industry and community groups to help restore and protect the Waikato River.	Partnerships established.	D
10	Partnerships with international organisations working on river restoration.	Partnerships established.	C-
11	Scholarship on the Waikato River and research to fill important information gaps preventing restoration.	Agreement with University of Waikato and Waikato-Tainui College for research and development, number of scholarships, Waikato River academic chair appointed.	C+
12	School cross-curriculum resources on restoration.	Prepared and delivered.	D

Table 13: Engagement Report Card (cont.)				
	Measure or indicator	**Target**	**Score**	
13	Professional development workshops for school teachers.	1 per year.	E	
14	Marae-based enterprises that include vocational training centred on restoration.	Enterprises established and supported.	D	
15	Articles and videos promoting the restoration and protection of the Waikato River.	Number of articles and videos.	D+	
16	A Waikato River festival held every 2 years to publicise restoration efforts and the value of the Waikato River to the community.	Organised and run.	C	
17	Awards are made that celebrate the success of restoration projects.	Organised and awards made.	D	
State indicators			**Current**	**Future**
18	Communities (iwi, hapuu, whaanau and individuals) have the knowledge, skills, attitudes and values that result in sound environmental behaviour (social surveys).	TBD	C	TBD
19	Knowledge (maatauranga Maaori and science) gained from research, good practice and existing relationships with the Waikato River is being effectively transferred and used (social surveys).	TBD	TBD	TBD
20	The unique relationship that the five river iwi have with the Waikato River is understood and recognised within the wider community and regional organisations (social surveys).	TBD	TBD	TBD
21	Communication and publicity initiatives effectively promote greater public knowledge and understanding of the health and wellbeing of the Waikato River (social surveys).	TBD	TBD	TBD

Grey text indicates best professional judgement.
TBD = to be developed.

3. Overall Report Card

The following report card is derived from the indicator scores in the ladder diagram in Section 6.5 of the main Report, and is the Study team's assessment of the current state of the Waikato River. The average score is D+, assuming aspirations have equal weightings.

Aspiration	Score
Fisheries and Kai	D-
Taonga Species	D-
Ecological Integrity	D
Aesthetics	C+
Swimming and Boating	C-
Human Health	C
Water Quality [4]	D+
Water Allocation	C
Significant and Historic Sites	C-
Access	C
Spiritual Values	D+
Local Prosperity	Not scored
National Prosperity	Not scored
Holism	C-
Engagement	D
Average	**D+**

[4] Water quality was scored in the Lower Waipa (Whatawhata), Lower Waikato (Tuakau), representative riverine lakes, representative peat lakes, and pasture tributaries – which are the sites that constrain meeting Te Ture Whaimana for water quality.

4. Scoring restoration indicators

4.1 Whitebait

Indicator	Methods outline
1. Adult iinanga prime stream habitat (km)	This indicator measures the amount of potential high quality iinanga habitat in rivers and streams, which is simply recorded at the start of restoration action and updated as restoration proceeds. The scores A, B, C, D, E were linearly distributed between ≥800 km (='A') and <25% of target (<200 km ='E').
2. Spawning habitat	This indicator measures the amount of potential spawning habitat. Historical length unknown, but if all banks in the river with appropriate tidal range and salinity had been utilised, spawning could have occurred within 30 km, but it is likely that only about 20km was used at any one time. The scores A, B, C, D, E were linearly distributed between ≥20 km (='A') and <20% of target (<4 km ='E').
3. Lowland stream habitat	Amount of potential stream habitat below Karaapiro Dam is 6,400 km (riverine with slope <3%). The current state of this potential habitat is largely unknown, but expert opinion suggests 25% is in good condition, 25% needs planting on northern side (plus fencing if that hasn't occurred already), the rest needs to be managed by physical and herbicide removal of macrophytes. In the example Report Cards the scores A, B, C, D, E were linearly distributed between the target ≥6,400 km ('A') and <25% of target (<1,600 km ='E'). The indicator for this action needs more robust scoring, using data collected from actual surveys of these streams and drains to map the course of the restoration actions and the type of actions chosen.
4. Iinanga tide gate migration barriers	This indicator assesses the barriers to migration posed by tide gates. There are presently 23 gates potentially restricting access to prime iinanga spawning and adult habitat. Issues are physical access, barriers at key migration times and barriers posed by the water quality behind gates (especially low DO concentrations). Scoring for this indicator in the example Report Cards is based on proportion of gates that pose significant barriers. The scores A, B, C, D, E were linearly distributed between '0' gates ('A') and >20 gates ('E'). In the future, this indicator may need to be developed using a combined index from a survey that measures physical access, barriers at key migration times and the quality of the water behind gates, using the following scheme or its equivalent. Physical access: total barrier=2, partial barrier = 1, no barrier = 0. Barrier at migration times total barrier = 2, partial barrier = 1, no barrier = 0. Poor water quality: DO < 2 mg/L = 2, DO 2 – 6 mg/L = 1, DO > 6 mg/L = 0. The overall score = mean area weighted gate scores and individual gate grades (from combined score) so that: A score = 0; B score = 1; C score = 2 ; D score = 3 ; E score 3–6. A mean area weighted gate scores might also be developed that takes into account the area of habitat behind each gate.

Indicator	Methods outline
Whitebait (cont.)	
5, 6, 8. Iinanga and banded kookopu culvert barriers (number)	Scoring indicators for culverts barriers was based on number of culverts that pose barriers. The scores A, B, C, D, E were linearly distributed between <10% of total number of culverts as barriers (='A') and 80% of total culverts (='E'). Once restoration actions get underway, surveys (to identify barriers) could record the information in a GIS layer, which then could be used to estimate the total area inaccessible to iinanga and banded kookopu. The indicator would then be scored based on these areas.
7. Adult banded kookopu habitat (km)	The historical habitat in the lower Waikato was unknown but may have been extensive if many streams and wetlands had forest cover. The present total length of first order streams providing prime habitat for banded kookopu = 308 km. The scores A, B, C, D, E were linearly distributed between ≥300 km ('A') and <25% of target (<50 km ='E').
9. Shallow lake habitat	See Ecological integrity – lakes.
10. Whitebait habitat score	The total whitebait productivity restored by removing barriers and restoring stream habitat was calculated by summing the area accessible, accounting for increased productivity from restoration actions, and also accounting for increased spawning and return of adults. **This indicator combines and integrates the above 9 other action indicators.**
11. Research on pest fish impacts	The indicator for this action used in the example Report Cards was scored 'A' if the research was funded and being carried out.
12. Whitebait fishery under one regulatory agency	The indicator for this action used in the example Report Cards was scored 'A' when this was completed.
13, 14. Whitebait catch and catch effort	Measuring populations of whitebait is challenging because fish move around and numbers are highly dependant on factors affecting the population in the ocean phase of their life cycles. This indicator method would be developed by collecting information from surveys of whitebaiters to estimate total catch and condition of the whitebait fishery. This requires that a management authority can be established with the legislative right to do this and has the resources to achieve it. There are considerable challenges to address to develop these indicators, in terms of accurate information, natural variability and off-site factors. It would take many years (10–20) to obtain sufficient information to address these challenges. The CPUE scores in the example Report Cards were based on expert opinion and surveys of fishers through Bay of Plenty rivers (Saxton et al., 2010).

Indicator	Methods outline
Whitebait (cont.)	
15. Water clarity (ariari board)	Water clarity can be measured using ariari boards, which is of direct relevance to fishers and the five river iwi. The method would need development and the relationship determined between it and the usual scientific measure (e.g., black disk, turbidity) measures.
16. Satisfaction for hospitality	Number of times that traditional hospitality is met by providing locally-caught whitebait to guests. This is an issue involving quality and quantity and would need to be developed by the lower Waikato iwi. The number of times in the example Report Cards were based on 8–10 marae in lower Waikato for own poukai and supply to Koroneihana.
Access to traditional fishing sites	Satisfaction with restoration of traditional fishing sites. This requires changes in legislation. The indicator would be developed from social surveys with local iwi (see http://www.niwa.co.nz/our-science/freshwater/research-projects/all/restoration-of-aquatic-ecosystems/social-research).
17. Knowledge transfer	This is an internal matter for iwi and needs development by individual iwi.

4.2 Tuna

Indicator	Methods outline
1, 2. Pond and wetland habitat	This indicator simply measures the area of pond and wetland habitat created on farms and in marginal low-lying pasture. The scores A, B, C, D, E were linearly distributed between the target of 700 ha (='A') and present day (0ha ='E').
3. Lowland stream habitat	See Whitebait.
4. Upstream transfer of elvers	In the example Report Cards, the scores A, B, C, D, E were linearly distributed between the target for on-growth of 2E+06 elvers (='A') and no transfer (='E').
5. Upstream passage and on-growing of juvenile tuna	In the example Report Cards, the scores A, B, C, D, E were linearly distributed between the target for on-growth of 800,000 elvers (='A') and no on-growth (='E'). In the future, the indicator for this action could be numbers or weight of tuna returns. For example, optimistic but realistic returns could be 60 tonnes (presently they are recorded as 2 tonnes).
6. Pump stations as spawning migration barriers	This indicator assesses the barriers to adult (spawners) tuna migration posed by 65 pumping stations. In the example Report Cards, the scores A, B, C, D, E were linearly distributed between the target of zero barriers ('A') and present day (>50 pump barriers ='E'). Future scores should be based on area or length of channel behind the pumps that have safe downstream passage in place.
7. Fisheries legislation on size	The indicator for this action used in the example Report Cards was scored 'A' when this was completed.
8. Reserves (ha)	This indicator will directly measure the area of reserves created (as part of measures seeking to ensure 40% of the original spawning stock can reach the sea). In the future, this indicator could be alternatively based on surveys of tuna numbers and sizes in the reserves.
9. Tuna habitat doubled	The total tuna productivity restored by removing barriers and restoring stream habitat was calculated by summing the area accessible, accounting for new areas and increased productivity from restoration actions, and increased return of elvers from the sea. **This indicator combines and integrates the above 8 other action indicators.**

Indicator	Methods outline
Tuna (cont.)	
10. Commercial catch	This indicator assesses the total number and size distribution of fish caught and also released (i.e., adult spawners). The overall aim of the restoration strategy is to sustainably double the weight of fish caught, but this will depend on the actions chosen. This indicator and its grading would be developed once it is clear what strategies have been put in place, the time line for these strategies and the further development of the habitat restored/fish biomass model from these strategies. The monitoring method would collect information from surveys of tuna fishers to estimate total catch and condition of the fishery. This requires that a management authority can be established with the legislative right to do this and has the resources to achieve it.
11. Cultural catch	This indicator is similar to the one above and would be monitored in the same way, but relates to river iwi being able to supply tuna as part of manaakitanga.
12. Access to traditional fishing sites	This index would need to be developed by river iwi.
13. Ability to implement and enforce raahui	This index would need to be developed by river iwi, and is related to establishment of reserves and new fisheries regulations.
14. Satisfaction with quality and quantity	The index would be developed from social surveys with river iwi (see http://www.niwa.co.nz/our-science/freshwater/research-projects/all/restoration-of-aquatic-ecosystems/social-research).
15. Knowledge transfer	This is an internal matter for iwi and needs development by individual iwi.

4.3 Taonga Species

Indicator	Methods outline
1, 2, 6, 7. Whitebait and tuna habitat and catch	See Whitebait and Tuna.
3. Riparian vegetation	See Aesthetics.
4, 5. Research on kooura, kaaeo, piiharau, kooaro and giant kookopu	The indicator for this action used in the example Report Cards was scored 'A' if the research was being carried out.
8. Tau kooura	Kooura (freshwater crayfish) are often common in pastoral and forested headwater streams, in edge-habitats along mid to high order streams and rivers, and in deeper areas of lakes. However, there is a lack of information on abundance along the Waikato main stem and in Waikato lakes. Abundance is best assessed by tau kooura in lakes, spotlighting (rama kooura) in wadeable areas of lakes and streams, or electric fishing in wadeable streams. This monitoring method would be based on population/size distribution, using traditional methods. It will need development with river iwi.
9. Tau Kaaeo/Kaakahi	Shallow lakes were once extensively colonised by freshwater mussels, but these have been almost completely lost through lake deterioration. It would be straightforward to develop an indicator based on kaaeo coverage (density) of the lakebed with river iwi. The present grade for most shallow lakes is 'E'.
10. Piiharau	A suitable indicator and scoring method would need to be developed from the proposed research programme.
11. Kooaro	A suitable indicator and scoring method would need to be developed from the proposed research programme.
12. Giant kookopu	A suitable indicator and scoring method would need to be developed from the proposed research programme.
13. Native bird densities	There are well established methods for bird surveys, and there are national and local surveys of birds (especially with interest around the release of bellbirds in the Hamilton area and because of initiatives to re-establish tui). This indicator would need development, however, because it is not possible to determine what would constitute a 'restored' ecosystem, given the fact that riparian restoration only is contemplated here, there are many other restoration efforts occurring nationally and because of the many factors that determine bird populations (e.g., predators and predator controls). It is therefore not a fundamental indicator for state but something that should be monitored, documented and developed as restoration proceeds.
14. Cultural materials fit for purpose	Plant species that have traditional significance to river iwi. This cultural plant index in riparian zones and wetlands will need to be developed by river iwi.
15. Plant species suitable for habitat	Plant species that have particular value as habitat and food resources for taonga species. This habitat plant index in riparian zones and wetlands will need to be developed by iwi in conjunction with DOC.

4.4 Ecological Integrity – Lakes

The action indicators for lakes can all be addressed by stage indicators.

Indicator	Methods outline
1. Riparian aesthetics	See Aesthetics.
2. LakeSPI	'LakeSPI Index' is a measure of the condition of native plants, the impact of invasive plants and grazing fish and the light climate of a lake determined by nutrients and suspended sediment and thus provides an overall indication of lake condition. The shallow lakes of the Waikato region have been graded using the LakeSPI Index. 'LakeSPI Index' is a measure of both the condition of native plants, the impact of invasive plants and grazing fish, and to some extent, the light climate of a lake (as determined by nutrients and suspended sediment) and thus provides an overall indication of lake condition. The higher the score the better the condition. The two indices that make up the LakeSPI Index are: 'Native Condition Index' – This captures the native character of vegetation in a lake based on diversity and quality of indigenous plant communities. A higher score means healthier, deeper, diverse beds. 'Invasive Impact Index' – This captures the invasive character of vegetation in a lake based on the degree of impact by invasive weed species. A higher score means more impact from exotic species. A lake scoring full points for all LakeSPI indicator criteria would result in a LakeSPI Index of 100%, a Native Condition Index of 100% and an Invasive Impact Index of 0%. For the purposes of placing them within the Report Cards, lakes have been categorised into five main groups indicating overall lake condition based on the LakeSPI Index. Lakes are grouped as being in an A 'excellent', B 'high', C 'moderate', D 'poor' or E 'non-vegetated' condition. Absence of submerged vegetation usually indicates severely degraded conditions of water clarity, sediment disturbance and/or pest fish disturbance (see Edwards et al., (2009) and http://www.ew.govt.nz/Environmental-information/Environmental-indicators/Inland-water/Lakes/lake10-keypoints/).
3. Emergent vegetation	Shallow lakes often have a band of emergent vegetation at the lake shore – an important component of the lake ecosystems. Grazing by pest fish and cattle, and/or competition from exotic weeds can destroy this vegetation. Emergent vegetation distribution is lake specific and depends on the depth, distribution and exposure. The indicator would be limited to lake edge only, and would need to consider a wider range of lakes to calibrate the scoring method, in particular locating the upper (A) and lower grades (D, E). The indicator and its scoring could be considered as a proportion of potential/historical extent, where A = >80% of potential, B = 50-80% of potential. C = 20-50% of potential, D = >5%, <20% of potential, E = <5% or dominated by aliens (e.g., Iris pseudacorus).

Indicator	Methods outline
Ecological Integrity – Lakes (cont.)	
4. Lake Trophic Index (TLI)	Nutrients, water clarity and algal levels determine a lake's trophic state which in turn reflects how well a shallow lake can support native freshwater plants and animals. The Lake Trophic Index of a lake is calculated for each of the four trophic indicators: chlorophyll a (Chla); secchi depth (SD); total nitrogen (TN); total phosphorus (TP). The method has been adopted as a Ministry for the Environment protocol (Burns et al., 2000). It is currently available for only 13 lakes in the Waikato region. The measure compares and integrates measures of nutrients, phytoplankton and clarity. Grade Lake Type Trophic Level Index A Microtrophic 2.0 A Oligotrophic 2.0–3.0 B Mesotrophic 3.0–4.0 C Eutrophic 4.0–5.0 D Supertrophic 5.0–6.0 E Hypertrophic 6.0–7.0 (See http://www.ew.govt.nz/Environmental-information/Environmental-indicators/Inland-water/Lakes/lake4-keypoints/).
5. Water clarity	See Swimming and boating.
6. Dissolved oxygen	See Ecological integrity – riverine habitats.
7. Pest fish	Pest fish are major pressures on wetlands, lakes and riverine ecosystems, through predation of, or competition with, native fish, overgrazing of native plants and aquatic weeds, bottom disturbance and increasing turbidity. The presence/absence of each of the destructive fish is a measure of state and pressure on lakes. At present lakes are graded A (no pest fish presence) or E (pest fish presence), because if present, they are assumed to be able to increase to full pest populations. A more refined indicator will need development when fish populations are controlled effectively by intensive netting. This is likely to be based in catch per unit effort (CPUE), and will need calibration as to what is a sustainable level. This refined indicator may also need to take into account several pest species.
8. Lake usage	Social surveys of lake usage and satisfaction will need to be developed using social surveys.

Indicator	Methods outline
Ecological Integrity – Lakes (cont.)	
9. Catchment nutrient loads	Catchment loads can be measured, although this requires an extensive monitoring effort. Instead nutrient loads could be predicted using appropriate models such as OVERSEER see (Appendix 9: Farms) which also incorporate the effects of restoration actions.
10. Internal lake load	To be developed. The TLI can be used as an indicator for total load which includes the internal lake load.
11. Water level indicator	The Waikato peat lakes habitats are particularly vulnerable to water level lowering. Environment Waikato monitors the type of water level control structures in peat lakes in the Waikato region. Control structures are one effective way of protecting water levels within the peat lakes. Most lakes without control structures are considered at high risk to the lowering of water levels. Their indicator shows that: Of the 31 peat lakes in the Waikato region, 55 percent (17 out of 31) are not protected 45 percent (14 out of 31) are protected by engineered water level control structures (see http://www.ew.govt.nz/Environmental-information/Environmental-indicators/Inland-water/Lakes/lake5-keypoints/). Additional measures to protect these lakes could be creating wide riparian buffer zones (e.g., 50 m) to allow vegetation to accumulate and to control drainage to the lake. These factors need further consideration and an indicator that integrates restoration measures may need to be developed.

4.5 Ecological Integrity – Riverine Habitats

Indicator	Methods outline
1. Tuna habitat	See Tuna habitat score.[a]
2. Whitebait habitat	See Whitebait habitat score.[a]
3. Riparian vegetation	See Aesthetics.
4. Turbidity (NTU)	See Water quality.
5. Dissolved oxygen	Dissolved oxygen is necessary for aquatic animals to breathe. Oxygen levels can be compromised by organic enrichment, lake stratification and excessive plant growth. This, in turn, reflects nutrient enrichment, which is a consequence of land use and its management. Scoring this indicator is based on Environment Waikato's classification of dissolved oxygen (% of saturation) as unsatisfactory <80% saturation (see http://www.ew.govt.nz/Environmental-information/Environmental-indicators/Inland-water/River-and-streams/riv1-report-card/). Scores for the Report Cards were based on measured values relative to these targets. The scores A, B, C, D, E were linearly distributed between >80% (='A') and =<20% ('E').
6. Temperature	High water temperatures, occurring in plumes of hot wastewater, or during the afternoon of hot days in mid-summer in streams lacking riparian shade, can be stressful to aquatic animals including native fish and invertebrates (Parkyn et al., 2009). Restoration will restore riparian shade to streams which will reduce high temperature excursions. Environment Waikato categorise optimum temperatures for spawning (May to September) as excellent <10^{o}C; satisfactory 10–12 ^{o}C; unsatisfactory >12 ^{o}C; and optimum temperatures for fish and macroinvertebrate health (October to April) as excellent <16^{o}C; satisfactory 16–20 ^{o}C; unsatisfactory >20 ^{o}C. An indicator could be developed based on these categories and monitoring data although it is probably the summer temperatures that are more important for assessing ecological integrity.
7. Periphyton cover in tributaries (%)	Periphyton is a complex assemblage of benthic algae, bacteria and fungi that grows on surfaces in streams. Periphyton is an important food source for stream biota. However, nuisance growths of periphyton can occur where there is ample light and nutrients. These growths can make the streambed habitat unsuitable for sensitive invertebrate species and make the stream unattractive for swimming and angling (Parkyn et al., 2010). Methods for monitoring periphyton are well established (Collier et al., 2007 Harding et al., 2009). An appropriate scoring system could be developed for Waikato tributaries.

Indicator	Methods outline
Ecological Integrity – Riverine Habitats (cont.)	
8. Shade	Shade plays an important role in the regulation of stream light and temperature, with profound effects on in-stream plant growth, ecosystem metabolism and the relative suitability of the habitat for differing biota (Parkyn et al., 2009). Shade should increase with riparian planting. Shade can be measured with specialised equipment or light meters. A suitable indicator could be developed based on the amount of optimum shade for different restoration objectives (e.g., tuna, iinanga, banded kookopu, piiharau, cultural materials and temperature limitations) using paired light meters (Parkyn et al., 2010).
9. Macrophyte cover and type	Macrophytes are important components of stream ecosystems. They provide habitat and cover for invertebrates and fish, and a surface for colonisation by algae and bacteria. They also reduce water velocity and encourage the deposition of fine particles and their roots help to stabilise the streambed. However, they can also have negative impacts. Dense growths of macrophytes in streams, particularly of invasive introduced species, can smother benthic habitats, reduce stream biodiversity, impede water flow, and their photosynthesis-respiration cycle can cause wide fluctuations in dissolved oxygen and pH (Parkyn et al., 2010). Instream macrophyte growth is strongly controlled by light availability and should respond to riparian planting. A macrophyte indicator could be developed similar to LakeSPI which measures cover and relative occurrence of native and exotic species. Alternatively, it could incorporate three other simple indices: Macrophyte Total Cover (MTC), Macrophyte Channel Clogginess (MCC) and Macrophyte Native Cover (MNC) developed for the macrophyte cover rapid assessment method of Collier et al., (2007) for wadeable streams.
10. Sediment composition	Streambed particle size is a strong driver of the biological community in streams. Fine sediments (sand and silt) are generally considered unsuitable for the majority of invertebrates (except for certain taxa such as worms, molluscs, some midges) and may affect native fish also. Most native fish use the streambed for shelter, foraging and nesting, thus benefit from large particles (cobbles and boulders) (Parkyn et al., 2010). Excessive amounts of very fine sediments (silt) affects aesthetics because they feel unpleasant to walk in and can turn the water turbid. Restoration action to afforest unstable lands, keep stock out of streams, reduce bank erosion and filter overland run-off should reduce fine sediment inputs. While there are a number of methods for determining sediment composition, a new method is currently being developed for fine sediments (Parkyn et al., 2010). An indicator could be developed from this new method, along with consultation with river iwi (over aesthetics) and an understanding of what should be the natural sediment composition at any particular site or reach.

Indicator	Methods outline
Ecological Integrity – Riverine Habitats (cont.)	
11. Algal blooms (chlorophyll µg/L)	See Water Quality.
13. Ecological health	This indicator measures the presence and numbers of freshwater invertebrates (such as insects, crustaceans and worms) in rivers across the region (see http://www.ew.govt.nz/Environmental-information/Environmental-indicators/Inland-water/River-and-streams/riv3-techinfo/). Different types of invertebrates have different tolerances to pollution and are also affected by quality of their habitat. This can be used to tell how good the water and habitat quality is by the types and numbers of invertebrates living in the river. The indicator integrates information from three metrics that reflect the sensitivity and diversity of the invertebrate community at a site, including: • Number of sensitive taxa ('species'): mayflies+stoneflies+caddisflies (EPT). • Percentage of sensitive taxa: %EPT. • Tolerance of taxa to pollution: Macroinvertebrate Community Index (MCI). The indicator is expressed as excellent, satisfactory and unsatisfactory. The example Report Cards have used Environment Waikato's satisfactory/unsatisfactory classification to produce the following grades: A = 80–100% of sites satisfactory or better. B = 60–80% of sites satisfactory or better. C = 40–60% of sites satisfactory or better. D = 20–40% of sites satisfactory or better. E = <20% of sites satisfactory or better. This is highly provisional as it is based on relatively few samples for this metric (about 50).
14. Fish Index Biodiversity Integrity (IBI)	The Fish IBI developed by Joy (2007) could be used to develop this indicator. On a catchment scale, an indicator can be developed based on the Diversity Index for Fish in Rivers (DIFR), which places the Waikato River (from below Lake Taupoo) at 2.7 (Rowe et al., 2010). This is comparable with the nationwide average of 2.6, but it is lower than the value of 3.0 or more which applies to relatively unmodified rivers. In the Waikato River, fish species diversity is biased (upwards) by the high number of exotic species. If these are removed, the measure decreases to 2.2. A value of 2.8 or more (excluding pest fish species) would indicate significant restoration.

4.6 Riparian Aesthetics

Indicator	Methods outline
1. Riparian vegetation	The method is based on the RMC aesthetic ratings (see Appendix 11: Riparian aesthetics) developed from Environment Waikato's 2007 surveys of streams throughout the Waikato region (Storey, 2010). Riparian management can enhance landscape aesthetics substantially by providing vegetation diversity with ribbons of green within developed pastoral and urban landscapes. Shrubs and trees have generally greater aesthetic appeal than pasture grass, and native vegetation has more appeal than exotic vegetation. However, aesthetics vary highly amongst individuals. RMC rating guide for enhancing stream aesthetics: 0 = bare ground or covered in blackberry and other invasive weeds. 1 = pasture with unconstrained livestock access to the stream, no trees. 2 = fenced pasture grasses without livestock access to the stream; or pasture with livestock access and a 1-2 types of exotic trees (e.g., willows and/or poplars). 3 = varied exotic dominated vegetation, limited livestock access. 4 = native shrubs or wetland is dominant vegetation type. 5 = native forest is dominant vegetation. The score is calculated from the proportion of the streambank under RMC score ≥4. The scores A, B C, D, are distributed linearly between the maximum of 100% of category 4, 5 (='A') and the minimum is 0% of category 4, 5 (= 'E').
2. Water clarity	See Water quality.
3. Colour	See Water quality.
4. Sediment composition	See Ecological integrity – riverine habitats.
5, Community satisfaction	Community satisfaction with appearance of river would be measured by a social survey.
5. Rubbish	Human derived rubbish, either organic or inorganic, can be a major concern for the public and its lack would be a measure of success in engagement in restoration, as well as aesthetics. A monitoring method proposed by Parkyn et al., (2010) monitors rubbish by noting and categorising rubbish that is large enough to be seen by the naked eye. An indicator could be developed by conducting some baseline assessments on reaches, especially in urban areas.

4.7 Swimming and Boating

Indicator	Methods outline
1. Strategic Swimming and Plan	The indicator for this action used in the example Report Cards was scored 'A' when the plan was completed. The present score, 'C', was based on present day progress by all river iwi.
2. Strategic Boating and Swimming Plan	The indicator for this action used in the example Report Cards was scored 'A' when the plan was implemented.
3. Snags removed at strategic locations	The indicator for this action used in the example Report Cards was scored 'A' when snags were removed at locations identified in the plan. Presently scored 'C' because some snag removal is occurring.
4. Aquatic weeds (sites controlled)	The indicator for this action used in the example Report Cards was scored 'A' when the Plan was implemented. Presently scored 'D' because weeds are controlled at some locations.
5. Satisfactory flows for regattas (agreements in place)	This action indicator was scored 'A' when all agreements have been established. Presently scored 'D' because of some existing successful agreements.
6a. *E. coli* (number per 100 ml)	*Escherichia coli* (*E. coli*) bacteria are used as an indicator of the human health risk from harmful micro-organisms present in water, for example from human or animal faeces. The scoring for *E. coli* in the example Report Cards was based on the regional plan which specifies median concentrations not exceeding 126 count/100 ml. It was also based on more recent Ministry of Health Guidelines (Ministry of Health, 2003). These guidelines specify three concentration zones similar to a 'traffic light' system. Concentrations <260 counts /100 ml are in the green zone and are acceptable Concentrations ≥ 260 counts /100 ml are in the orange zone and trigger further sampling to investigate these concentration of concern. Concentrations > 550 counts/ 100ml are in the red zone and unacceptable for contact recreation and are equivalent to 'must close beach'. Scores for the Report Cards were based on measured or predicted values relative to the Ministry of Health (1999) Recreational Guidelines of 126 count/100 ml and the Ministry of Health (2003) red zone. The scores A, B, C, D, E were linearly distributed between ≤=126 (='A') and ≥ 550 ('E').
6b. *E. coli* (alternative method)	An alternative method may need to be developed with the more recent Ministry of Health Guidelines (Ministry of Health, 2003). Note that Environment Waikato have used these guidelines and the following classification for *E. coli*: excellent <55 /100 ml; satisfactory 55 - 550 /100 ml; unsatisfactory >550 /100 ml (see http://www.ew.govt.nz/Environmental-information/Environmental-indicators/Inland-water/River-and-streams/riv2-keypoints/).

Indicator	Methods outline
Swimming and Boating (cont.)	
7. Clarity	Water clarity and underwater visibility is important for recreation such as swimming and boating. It is also important from an aesthetic point of view – most people prefer clear water in rivers and streams. To allow good visibility for swimming, Ministry for the Environment guidelines specify that people should be able to see at least 1.6 m underwater. Clarity is determined by suspended sediment, phytopankton and dissolved colour concentrations in the water. These, in turn, reflect land use and its management, erosion and artificial drainage of peat lands. The targets are described in Appendix 13: Water quality and are 4 m in the upper river, 1.6 m everywhere else, except for 1 m in the lower Waikato (below the Waipa confluence). Scores for the Report Cards were based on measured or predicted values relative to these targets. The scores A, B, C, D, E were linearly distributed between ≥target (='A') and 0 m ('E'). Note that Environment Waikato have a classification for clarity of: excellent > 4 m; satisfactory 1.6 – 4 m; unsatisfactory <1.6 m. Their scoring for their report cards is based on number of samples which fall in these categories (see http://www.ew.govt.nz/Environmental-information/Environmental-indicators/Inland-water/River-and-streams/riv2-report/).
9. Toxic algal blooms	Blue-green algae are potentially toxic, and high concentrations can be associated with acute or chronic toxicity to aquatic animals, watering stock, dogs, and humans through drinking-water supplies. Blue-green algae (BGA) have been monitored in the main stem of the Waikato River and in some of the shallow lakes in the lower river. Monitoring has been based on older Ministry for the Environment Guidelines for BGA cell counts for drinking-water supplies of <2,000 counts/100 ml and 15,000 counts/100ml for contact recreation. New guidelines use a traffic light system based on the volume of BGA. However, monitoring information is only now being collected and older data is being converted to this form. This indicator will need development in the future based on the new guidelines, conversion of the historical monitoring data where possible, and new monitoring data. In the Report Cards, the risk of large (and hence problematic) BGA blooms was assessed using chlorophyll data. The Study team determined that the relationships between chlorophyll concentrations and the occurrence, size and extent of BGA blooms suggested that there is a low risk of a large BGA bloom if total chlorophyll was less than 10 µg/L. The scores A, B, C, D, E were linearly distributed between <=target ('A') and ≥ 2 x target ('E').

Indicator	Methods outline
Swimming and Boating (cont.)	
10. Duck itch (survey of parasites at weed control sites)	This indicator would need research and development. The indicator may be the host snail, the parasite or some proven correlating parameter, such as weed density.
12. Satisfaction with interaction with the river	This indicator for satisfaction with ability to use preferred skills, practices and methods when interacting with the river will need development by five river iwi.
13. Surveys of recreational activity and satisfaction	The index would be developed from social surveys with river iwi and with the wider community (see http://www.niwa.co.nz/our-science/freshwater/research-projects/all/restoration-of-aquatic-ecosystems/social-research).

4.8 Human health

Indicator	Methods outline
1. Treated sewage discharges to water (volume)	This action indicator is scored through the proportion of treated sewage discharges that are discharged to land, wetlands or through rapid infiltration devices. Currently score 'D' because some WWTP use land disposal or will do so in the future.
2. Duck itch (sites weeds controlled)	The indicator for this action used in the example Report Cards was scored 'A' when the Swimming and boating plan was implemented. Presently scored 'D' because weeds are controlled at only 2 locations.
3. Streams fenced on dairy (%)	See Water quality.
4. Streams >= 3rd order fenced on sheep and beef	See Water quality.
5. Septic tanks	The action indicator is based on cleaning frequency, and in the Report Cards this was the proportion of septic tanks on 2–3 year cleaning cycle. In the Report Card this was scored 'C' because 60% are already on that cleaning cycle. In the future, it should be based on the proportion of septic tanks that meet satisfactory guidelines in terms of distance to waterways, condition and operation. Such an indicator needs development, through actual surveys of septic tanks near waterways.
6. Marae with treated water	Proportion of marae with water treatment plants. In the Report Card this was scored 'E' because it is assumed none have water treatment (however this does not imply poor drinking-water quality).
7. Geothermal fluids discharged (%)	Existing consent condition should result in no untreated discharges to the river. This indicator records the proportion of geothermal fluids discharged (currently about 50% from Wairaakei).
8. Food basket health risk	The indicator for this action used in the example Report Cards was scored 'A' if the research was being carried out.
9. Arsenic release risk	The indicator for this action used in the example Report Cards was scored 'A' if the research was being carried out.
10. *E. coli* (no. per 100 ml)	See Swimming and boating.

Indicator	Methods outline
Human health (cont.)	
11. Turbidity (high flows)	Turbidity is routinely monitored and used as an ecological indicator. It may also be used in another way for ecological health. This is based on the fact that there is a relationship between *E. coli* and turbidity (particulate matter) at high flows. *E coli* levels are much higher during high turbidity (suspended sediment), which probably reflect common processes of washoff and association of bacteria with suspended sediment. Most weather and flows during stormflows are not condusive to contact recreation. However, there are some conditions which are suitable for contact recreation that involve elevated turbidity, e.g., high turbidity from localised rain storms upstream, long recession flows during warm, fine weather. This indicator needs development to determine a turbidity (NTU) or clarity (m) where the *E. coli*/turbidity relationship indicates *E. coli* levels of concern. Why do we need this indicator? Turbidity is much easier to measure than *E. coli*, and can be measured continuously and remotely and does not require rapid return of samples to the laboratory. It may also be developed as an indicator for land management action where these actions reduce sediment inputs to receiving waters.
12. Food basket health risk (mercury concentrations in food)	At present there is limited historical data available which suggests some risk (see Appendix 21: Toxic contaminants). This indicator needs development (together with appropriate government agencies, e.g., New Zealand Food Safety Authority) from further monitoring and up-to-date information over a greater geographical area, for Hg levels in kai and kai consumption patterns.
13. Hg in hair samples of river iwi	This potential indicator is currently being utilised in a NIWA research project on traditional food sources (Phillips, 2008) to help understand exposure.
14. Food basket health risk (arsenic concentrations in food)	Arsenic is not strongly accumulated in kai except for watercress, where it can be taken up from both the water and the sediments (Robinson et al., 2003). A health assessment of watercress from Lake Ohakurii has indicated that regular consumption of 16g of fresh watercress a week from Lake Ohakurii would be sufficient to exceed the tolerable daily intake (Robinson et al., 2006). The low availability of watercress in the Waikato River main stem is considered to be a significant limitation to regular dietary consumption. (The hyperaccumulation of As by some aquatic plants, including watercress, also makes these suitable for monitoring ambient As conditions). Indicator grades are yet to be developed after collecting sufficient data. However, the small quantity needed to exceed tolerable daily intake suggest this grade is probably 'E' at present in Lake Ohakurii.
15. Arsenic release risk (arsenic in hyperlimnion µg/L)	This indicator will need to be developed from laboratory mobilization experiments and monitoring of 'A's concentrations in the hyperlimnion (bottom waters).

Indicator	Methods outline
Human health (cont.)	
16. Arsenic risk in water (downstream of Ohakurii)	The risk of arsenic release can also be assessed by monitoring arsenic levels in the river downstream from Ohakurii. This also addresses the desire by Maaori to drink untreated surface water. While this desire is constrained by risk of infection by pathogen organisms, it can also be constrained by arsenic levels. Arsenic concentrations are routinely monitored by Environment Waikato (mean 20 µg/L range 15–40 µg/L; background is ~11 µg/L from Lake Taupoo). The following was summarised from Piper and Kim (2006). Health risk at 50 µg/L - intellectual impairment in children and a significant cancer risk. Rarely (if ever) occurs in river. Cancer risk at 20 µg/L - excess bladder/lung 1:140, excess skin 1:1700. Cancer risk at 10 µg/L - excess bladder/lung 1:300 (Ministry of Health, 2005; drinking-water guideline). Cancer risk at 5 µg/L - excess bladder/lung 1:500. Cancer risk at 3 µg/L - excess bladder/lung 1:900. Any indicator would need development with Ministry of Health, but a suggested approach could be based on comparing mean concentrations in water with cancer or health risk, e.g., A <3 µg/L - very low cancer risk, achievable by conventional water treatment. B 3–10 µg/L - low cancer risk, background (Lake Taupoo gates). C 11–20 µg/L - low – moderate cancer risk, these concentrations occur frequently in river. D 21–50 µg/L - moderate cancer risk, these concentrations occur frequently in river at the present day. E >50 µg/L - significant cancer risk and intellectual impairment in children.
17. Arsenic release risk (DO in hyperlimnion)	Dissolved oxygen in the hyperlimnion with concentrations <2 mg/L is strong indicator of developing anoxic conditions. This indicator will need development through surveys of depth profiles of dissolved oxygen in Lake Ohakurii, and other lakes downstream. See Ecological integrity – riverine habitats.
18. Duck itch parasite	See Swimming and boating.
19. Iwi satisfaction with food basket health risk	The index would be developed from social surveys with local iwi (see http://www.niwa.co.nz/our-science/freshwater/research-projects/all/restoration-of-aquatic-ecosystems/social-research).
Viruses (potential future method)	Based on direct measures of human adenoviruses and retroviruses. These viruses are indicators for human viral pollution, septic tanks and poor WWTP treatment. They are very difficult and costly to monitor. A major issue at present is the methodology which keeps changing (and improving). Different methods are not directly comparable. This indicator could be developed in the future.

Indicator	Methods outline
Human health (cont.)	
Cryptosporidium (potential future method)	Cryptosporidium is a human pathogen, largely derived from dairy cows. It is therefore an indicator of human pathogen pollution, a specific zoonose, protozoan pollution and contamination of waterways by dairy cows. It is, however, difficult to measure. It could be developed as an indicator in the future when stable, routine methodology becomes available.

4.9 Water Quality

Indicator	Methods outline
1 – 9. Farm actions	All the farming actions (e.g., fencing, planting and fertiliser controls) are scored by the proportion of farm area or waterways length which have successfully employed those actions.
10. Total nitrogen (TN)	Nitrogen is a nutrient for plants. Excessive amounts can encourage the growth of aquatic plants to nuisance levels, especially algae. Total nitrogen is a direct measure of the extent of nutrient enrichment and the risk of algal blooms. These reflect land use and its management, and WWTP discharges. The targets for TN are described in Appendix 13: Water quality and are 300 µg/L for the upper river (above Karaapiro Dam) and 500 µg/L elsewhere. Scores for the Report Cards were based on measured or predicted values relative to these targets. The scores A, B, C, D, E were linearly distributed between <=target (='A') and ≥ 2 x target ('E'). Note that Environment Waikato have a classification for total nitrogen as: excellent <100 µg/L; satisfactory 100–500 µg/L; unsatisfactory >500 µg/L. Their report card scoring is based on number of samples which fall into these categories (://www.ew.govt.nz/Environmental-information/Environmental-indicators/Inland-water/River-and-streams/riv1-report-card/).
11. Total phosphorus (TP)	Phosphorus is a nutrient for plants. Excessive amounts can encourage the growth of aquatic plants to nuisance levels; especially algae. Total phosphorus is a direct measure of the extent of nutrient enrichment, and the risk of algal blooms. These reflect land use and its management, and WWTP discharges. The targets for TP are described in Appendix 13: Water quality and are 20 µg/L for the upper river (above Karaapiro Dam) and 35 µg/L elsewhere. Scores for the example Report Cards were based on measured or predicted values relative to these targets. The scores A, B, C, D, E were linearly distributed between <=target ('A') and ≥ 2 x target ('E'). Note that Environment Waikato have a classification for total phosphorus as: Excellent <10 µg/L; Satisfactory 10–40 µg/L; unsatisfactory >40 µg/L. Their report card scoring is based on number of samples which fall into these categories (://www.ew.govt.nz/Environmental-information/Environmental-indicators/Inland-water/River-and-streams/riv1-report-card/).
12. Clarity	See Swimming and boating.
13. Colour	The colour of the water is important for aesthetic reasons. The river changes from blue, clear water at the Taupoo Gates, to greeny-blue in the lower hydrolakes and middle Waikato River, to yellow green then yellow-brown in the lower river. The targets for colour are <10 Munsell units below the values that are predicted to have existed in the river in the 1920s prior to the dams being built or peat land being drained (see Appendix 13: Water quality). Scoring in the Report Cards was based on a linear scale: where it is measured or otherwise a predicted change in Munsell units scores. The scores A, B, C, D, E were linearly distributed between <=target ('A') and ≥ 2 x target ('E').

Indicator	Methods outline
Water Quality (cont.)	
14. Turbidity (NTU)	Turbidity is a measure of the murkiness of water, reflecting the amount of sediment and algae in the water. High turbidity reduces the amount of light available for plants to photosynthesise. It also makes it difficult for fish and other animals to see their prey (but may protect prey). It inhibits native fish migrations, especially banded kookopu. Turbidity is determined by suspended sediment and phytopankton concentrations in the water. These, in turn, reflect land use and its management, and erosion. Turbidity should be less than 5 NTU (turbidity measurement scale) for water to support plant growth. This indicator was not scored in the Report Cards, but could be based on Environment Waikato's Classification for turbidity at low flow of unsatisfactory >5 NTU. Note that Environment Waikato have a classification of excellent <2 NTU; satisfactory 2–5 NTU; unsatisfactory >5 NTU. Their report card scoring is based on number of samples which fall into these categories (://www.ew.govt.nz/Environmental-information/Environmental-indicators/Inland-water/River-and-streams/riv1-report-card/).
15. Chlorophyll	Chlorophyll is used as a measure of total algal biomass. High levels can affect aesthetics, clarity and colour and also be indicative of high risks of cyanobacteria (blue-green algae) blooms. Targets for the Waikato are outlined in Appendix 13: Water quality, and were based on trigger level of 5 µg/L, warning level of 10 µg/L and water filter-clogging levels of 20 µg/L. A target of 5 µg/L was set for the Upper Waikato, and 10 µg/L elsewhere. Scores for the Report Cards were based on measured or predicted values relative to these targets. The scores A, B, C, D, E were linearly distributed between <=target (='A') and ≥ 2 x target ('E').
16. Cyanobacteria (Blue-green algae)	See Swimming and boating.

4.10 Water Allocation

The need for, and the type of indicators used for assessing water allocation will need to be determined once the Regional Plan Variation 6 (RPV6) is in place. Possible indicators may relate to water take being optimised to efficient water use and the impact of irrigation on nutrient exports from farmland. These would require expert development (e.g., in the latter case, irrigation may affect other indicators e.g., nutrients, clarity, chlorophyll, blue green algal blooms) and restoration outcomes. River iwi may wish to develop an indicator that assesses whether taangata whenua values have been considered in consents for water takes. The Study team considers it prudent to await the outcome of RPV6 before considering indicator development.

4.11 Significant and Historical Sites

Indicator	Methods outline
1. Waahi Tapu and Significant Sites Management Plan.	The indicator for this action used in the example Report Cards was scored 'A' when this was completed. The present score, 'C', was based on present day progress by all river iwi.
2. Joint Management Agreements (JMA) between iwi and LAs.	A short-term indicator could be based on the proportion of JMAs signed (% completion). In the long term, a performance indicator could be developed which is a measure of ongoing satisfaction with relationships. In the example Report Cards, it was assumed that while none have been signed, there has been significant progress in relationships between river iwi and LAs (hence 'C').
3. Signage meets management plan (% completion).	An indicator could be based on the proportion of sites that have adequate signage and correct place names consistent with the management plan. In the example Report Cards it was assumed that existing signage contributes to this indicator, but much needs to be done (hence 'D').
4. Restoration of sites meets Management Plan (% completion).	An indicator could be based on the progress of restoration consistent with the Management Plan % completion. In the example Report Cards it is assumed that existing restoration had moved the score to 'D'.
5. The community understands the historical and cultural associations of sites with the river (social surveys).	This indicator will need development through social surveys.
6. Iwi/community are satisfied that significant sites are protected (and where appropriate) recognised.	This indicator will need development through social surveys.
7. Iwi satisfied that valued features of key sites/river reaches are protected.	This indicator will need development through social surveys.

4.12 Access

Indicator	Methods outline
1. Access Management Plan.	The indicator for this action used in the example Report Cards was scored 'A' when this was completed. The present score, 'C', was based on present day access initiatives by LAs.
2. Proportion of main stem Waikato and Waipa with walkways and cycleways meets management plan (% completion).	The proportion of riverbanks that has pathways and cycleways consistent with the management plan. Presently scored 'C' because access is excellent in some areas and patchy in others.
3. Access to historic sites, collection sites for kai and cultural materials meets management plan (% completion).	The proportion of riverbanks that has access consistent with the management plan. Presently scored 'C' because access is excellent in some areas and patchy in others.
4. Number and distribution of reserves meet management plan (% completion).	The proportion of riverbanks that has reserves consistent with the management plan. Presently scored 'C' because of existing reserves.
5. Number and distribution boat ramps meet management plan (% completion).	The proportion of riverbanks that has boat ramps consistent with the management plan. Presently scored 'C' because of existing boat access.
6. Iwi satisfaction with access.	This is probably best assessed through a cultural recreation index (see Appendix 29: Monitoring and evaluation).
7. Community satisfied with access (social survey).	This indicator will need development through social surveys.

4.13 Spiritual Values

Indicators	Methods outline
1. The relationships of river iwi, their culture and traditions with the Waikato River which are taonga to them, and integral to their tribal identities (social survey).	These two state indicators need to be developed from social surveys with river iwi and the wider communities (see http://www.niwa.co.nz/our-science/freshwater/research-projects/all/restoration-of-aquatic-ecosystems/social-research).
2. The relationships of the wider Waikato community, their culture and traditions with the Waikato River (social survey).	
3. All statutory plans recognise and provide for river iwi and wider Waikato community economic, social, cultural and spiritual relationships with the Waikato River.	See Holism.

4.14 Regional and national economic wellbeing

This is a specialist area and would be assessed using economic models to estimate net regional and national value and employment added. The Study team recommend that this is updated every five years.

4.15 Holism

Indicator	Methods outline
1. Precautionary principle in all plans, policies and decision making.	Plans that have been audited and changed if necessary (% complete).
2. Plans, policies and rules take into account cumulative effects including multiple stressors.	Plans have been audited and changed if necessary (% complete).
3. Plans and policies take into account cultural, spiritual, social and economic relationships of river iwi and wider community with the Waikato River.	Plans have been audited and changed if necessary (% complete).
4. Decision making is guided by effective national policy and guidelines.	Waikato River Authority determines where national policy and guidelines are needed, makes recommendations with other regional authorities and monitors outcomes (% complete).
5. An integrated statutory management plan for the Waikato River has been implemented that encompasses physical, chemical, biological, social, economic, cultural and historic matters, at a regional, sub-catchment and farm scale.	Plans have been audited and changed if necessary (% complete).
6. Co-management agreements have been established between river iwi and local authorities.	Co-management agreements established (% complete).
7. The methods used by local authorities are standardised.	Procedures, guidelines and standards are used by local authorities where possible.
8. Actions to restore the Waikato River are being co-ordinated through the development and implementation of non-statutory management plans.	See Swimming and boating, Significant and historic sites, and Access.
9. Joint industry-community accords have been established.	Accords identified and established. In the short term, the indicator could be the number successfully established. In the long term, a performance indicator could be developed which is a measure of ongoing satisfaction with relationships.

4.16 Engagement

Indicator	Methods outline outline
1. Iwi commissioners trained.	Ongoing action based on numbers trained per year or total numbers of active commissioners. It should be refined after optimum numbers are determined.
2. Commissioner-run river iwi workshops.	Ongoing action based on number of training courses.
3. Waikato River focused public education centres.	Number of visitor centres, but could change in the future to number of visitors.
4. Training workshops on restoration methods.	Number of workshops and workshop attendees.
5. Financial support and resources to co-ordinators working with iwi and community groups.	No grading, financial support stated. Performance indicator will need to be developed.
6. Repository of equipment that can be used by iwi and community groups.	No grading, but a performance indicator (e.g., equipment register).
7. Centralised databases and auditing system for monitoring data.	% completion.
8. Culturally appropriate monitoring tools.	Not graded but register of CHI developed and reported to Waikato River Authority.
9. Partnerships between Waikato River Authority, industry and community groups.	After partnerships have been identified and established, a performance indicator could be developed which is a measure of ongoing satisfaction with relationships.
10. Partnerships with international organisations working on river restoration.	Partnerships identified and established. Goals for a performance indicator would need to be developed, such as visits, joint projects, and scientific papers. Annual report presented to Waikato River Authority.
11. Scholarship on the Waikato River and research.	Not graded, but a number of projects, papers, reports, honours and assessment of output usefulness for restoration recorded.
12. School cross-curriculum resources on restoration.	Curriculum needs identified and developed (% completion).
13. Professional development workshops for school teachers.	Not graded. Number of participating teachers recorded.
14. Marae-based enterprises that include vocational training centred on restoration.	After enterprises established and supported, performance indicators could be developed based on the nature of the activities.
15. Articles and videos promoting the restoration and protection of the Waikato River.	Not graded, but an assessment on the number/quality of articles and videos is presented to Waikato River Authority and public.

Indicator	Methods outline
Engagement (cont.)	
16. A Waikato River festival held every 2 years to publicise restoration efforts and the value of the Waikato River to the community.	Not graded, but a detailed assessment is presented to the Waikato River Authority and public after each festival.
17. Awards are made that celebrate the success of restoration projects.	Not graded, but a report would be presented to the Waikato River Authority annually.
18. Communities (iwi, hapuu, whaanau and individuals) have the knowledge, skills, attitudes and values that result in sound environmental behaviour (social surveys).	The next four state indicators are the primary methods for assessing engagement. These indicators would need to be developed from social surveys with river iwi and the wider communities (see http://www.niwa.co.nz/our-science/freshwater/research-projects/all/restoration-of-aquatic-ecosystems/social-research).
19. Knowledge (maatauranga Maaori and science) gained from research, good practice and existing relationships with the Waikato River is being effectively transferred and used (social surveys).	
20. The unique relationship that the river iwi have with the Waikato River is understood and recognised within the wider community and regional organisations (social surveys).	
21. Communication and publicity initiatives effectively promote greater public knowledge and understanding of the health and wellbeing of the Waikato River (social surveys).	

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