

# TANK: Impact Assessment Within a Collaborative Engagement Process

New Zealand Association for Impact  
Assessment  
28<sup>th</sup> November 2018

Mary-Anne Baker  
Senior Planner  
Hawkes Bay Regional Council

# Impact assessment for the TANK plan

## 1. Historic overview

- Decision making process
- Tools
- Agreements

## 2. Values approach

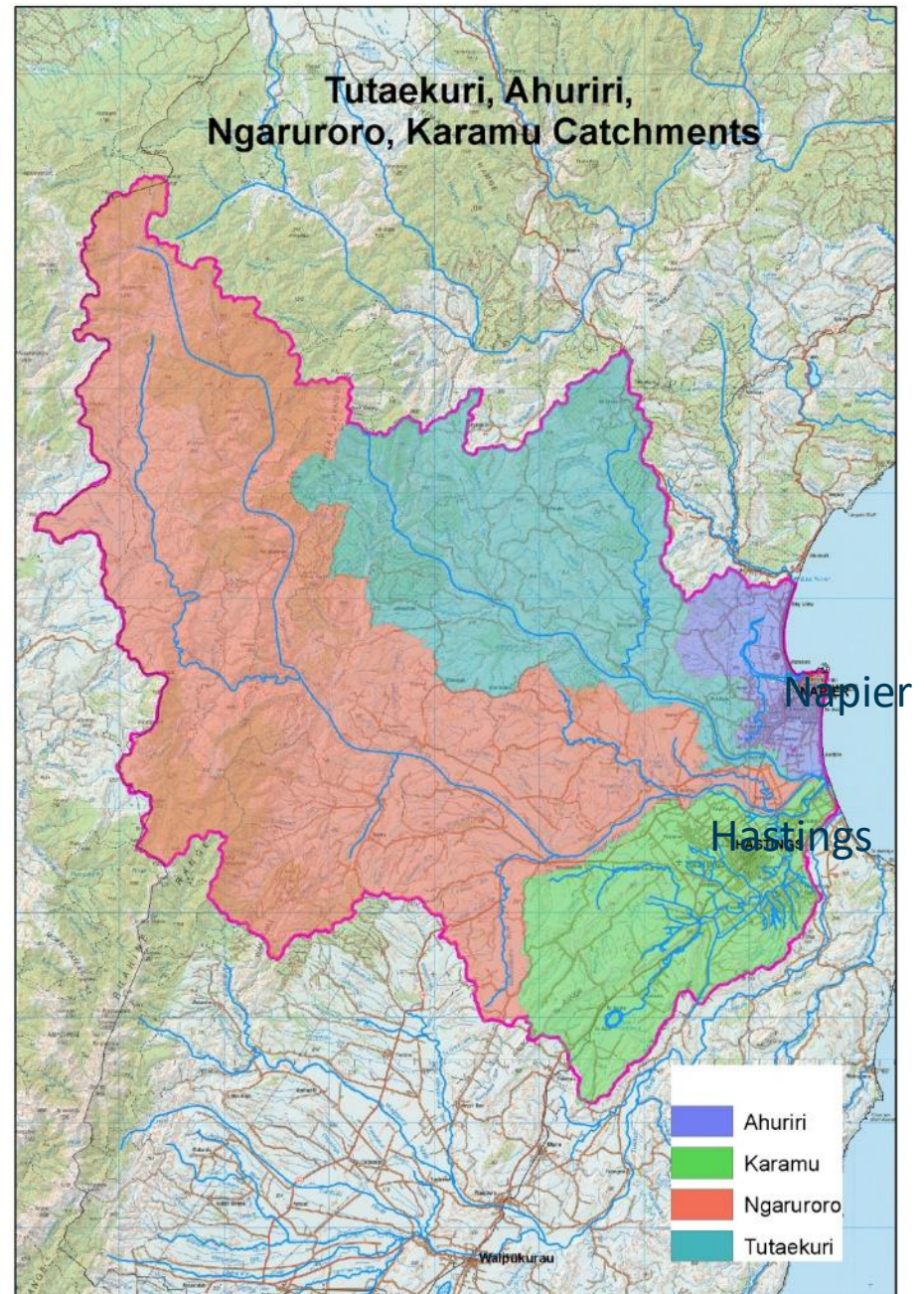
- Outcomes for values
- Developing different management scenarios
- Making decisions
- Understanding impacts

# Greater Heretaunga and Ahuriri Land and Water Plan Change (TANK)

Catchments defined from surface water boundaries

## Regional Plan; Freshwater Management

- managing the sustainable use, development and protection of freshwater resources



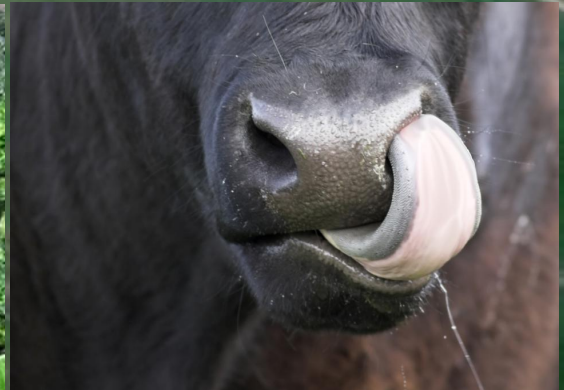
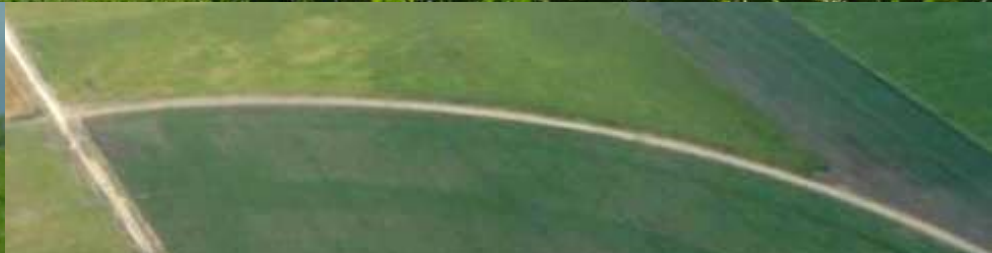
# What is TANK?

- ‘Collaborative’ Group formed in 2012
- The TANK Group is a community based approach to developing a regional plan for the **Tūtaekurī, Ahuriri, Ngaruroro and Karamu** Catchments
- Included tangata whenua and representatives of wide range of community and industry groups including the TLAs
- The Group has recommended plan change provisions for the management of freshwater quality and quantity for the Regional Resource Management Plan (RRMP) to the HB Regional Planning Committee

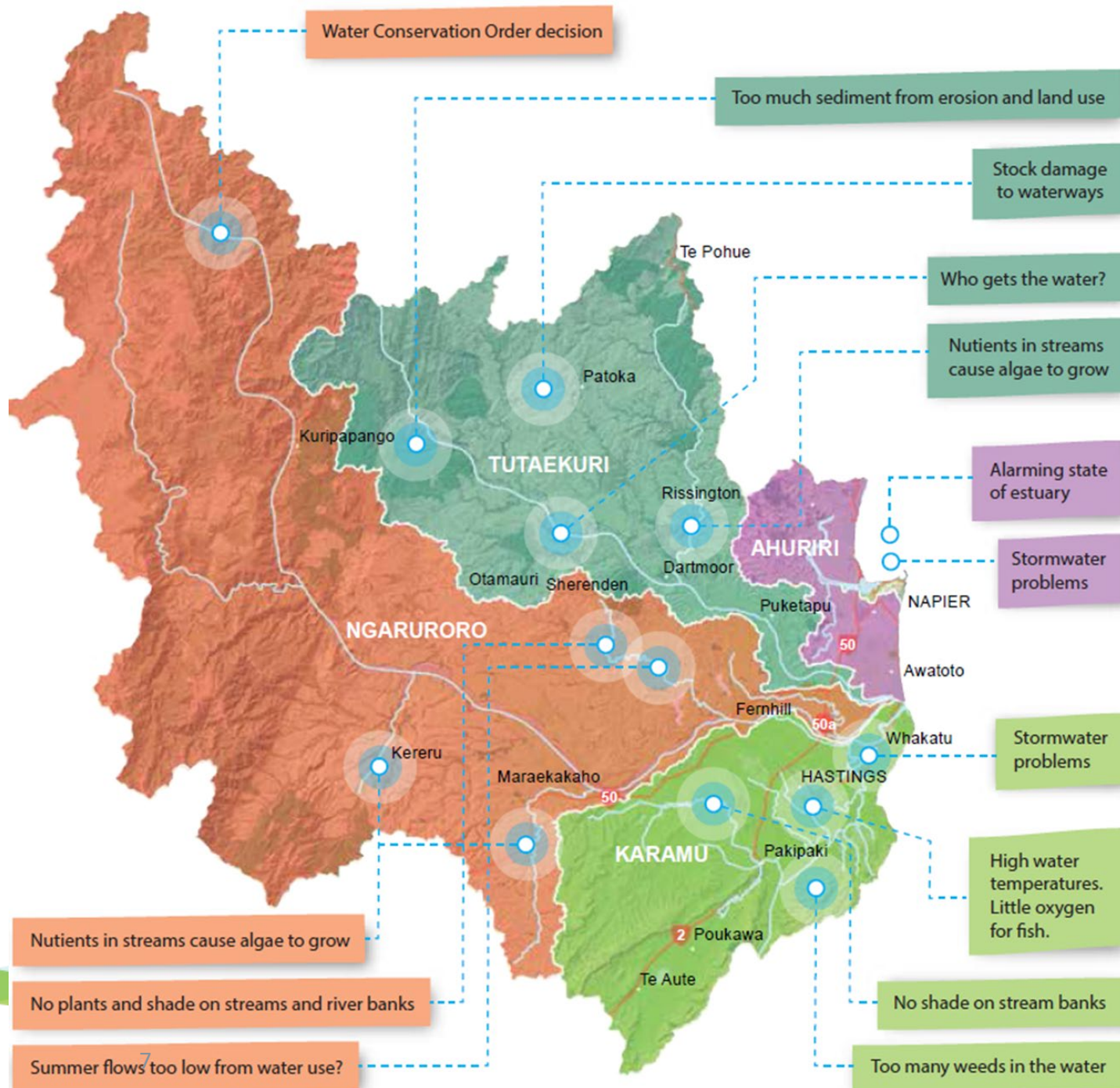












# Multiple Uses and Values of Water

Multiple Objectives for its Management

A Range of Quality and Quantity Issues  
Complexities;

Social, economic and cultural

Scientific information

Environmental processes and inter-connectivity

Future risks – demand, climate change

Uncertainties



# Setting the Scene

The TANK project was established in a time of rapid change in relation to how decisions about water were made



LAND WATER US

## HAWKE'S BAY LAND AND WATER MANAGEMENT STRATEGY



LAND & WATER  
FORUM



HOME

OUR SCIENCE

RESOURCES

PUBLICATIONS

ABOUT US

Our Ambitions

Plants, animals & fungi

Greenhouse gases

Soils & landscapes

Sustainable business & living

E-science

Research portfolios

### FRESHWATER VALUES, MONITORING AND OUTCOMES

#### Planning and decision-making

Collaborative Processes

Regional Council Forum

Valuing Our Waters

TANK collaborative process

River Values Assessment  
System

Assessing Values for Resource  
Management Discussions

Supporting Freshwater Decision-  
Making

Mātauranga Māori

#### Monitoring and effectiveness

Home » Our Science » Research portfolios » Supporting Business and Policy » Freshwater Values, Monitoring and Outcomes » Planning and decision-making » TANK collaborative process



## TANK COLLABORATIVE PROCESS (HAWKE'S BAY)



In 2012 we started working with the Hawke's Bay Regional Council, which has convened a collaborative stakeholder group to recommend water quantity and quality limits for the Greater Heretaunga and Ahuriri catchment plan change.

## NATIONAL POLICY STATEMENT

for Freshwater Management <sup>2014</sup>

issued by notice in gazette on 4 July 2014

# Structured Decision Making

- All values are equally legitimate
- SDM - provides foundation for the consideration of alternatives, benefits and costs



# Decision process

Possible Values, Objectives, Performance Measures and Management Variables For Policy Options

<b>Values</b> =>	<b>Objectives</b> =>	<b>Performance Measures</b>	<b>Management Variables</b> (for Policy Options)
Primary Production	Create new jobs in Hawke's Bay	New full-time jobs in horticulture & farming	Minimum flow; allocation regime & volume
Trout fishing	Improve river for trout fishing	Trout habitat as % of maximum	Minimum flow; nutrient levels; riparian vegetation
Mauri of river	Restore mauri of river	Cultural health index	Minimum flow; stock exclusion; nutrient levels

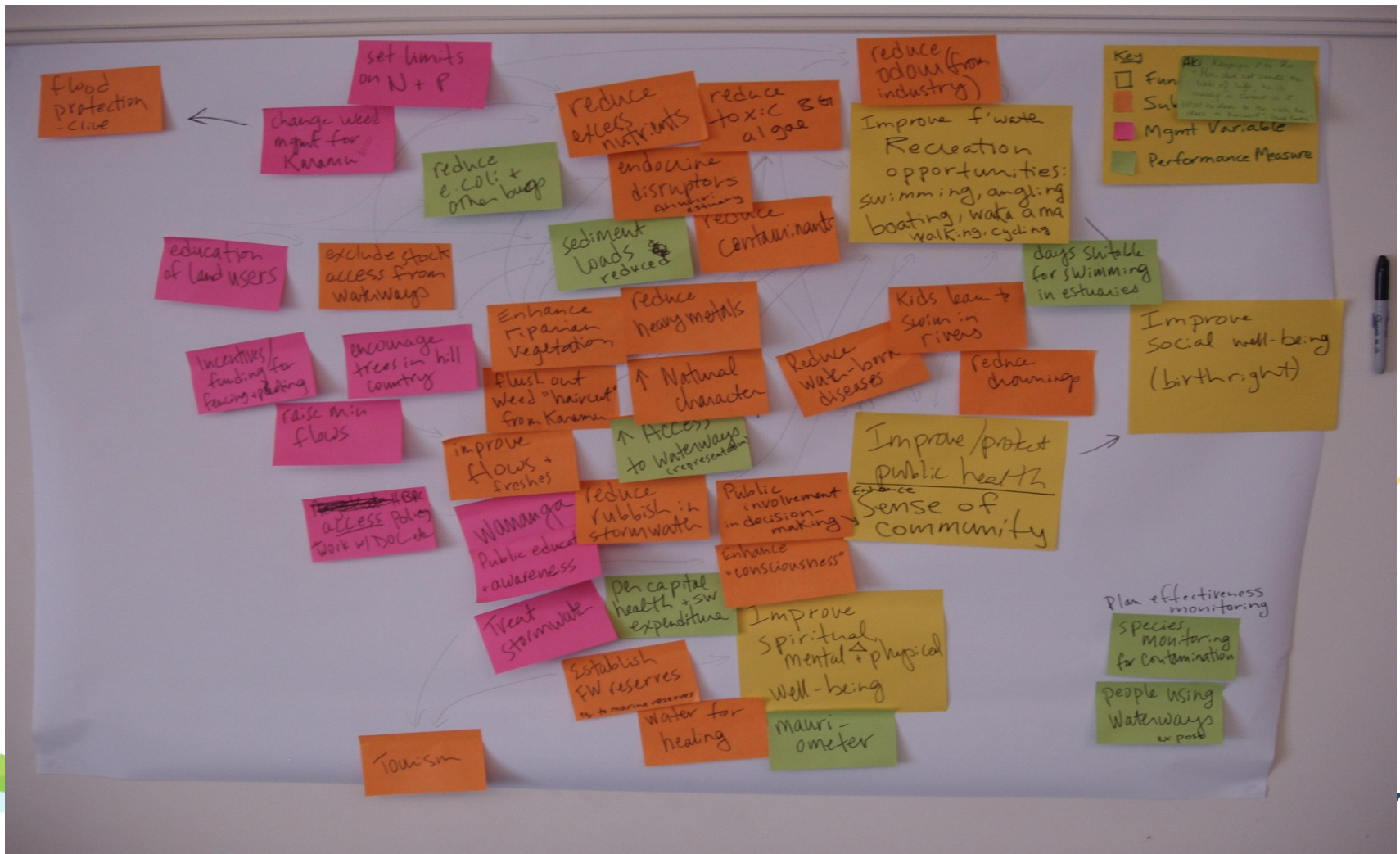
# Consequences Table

Possible Performance Measures and Policy Options

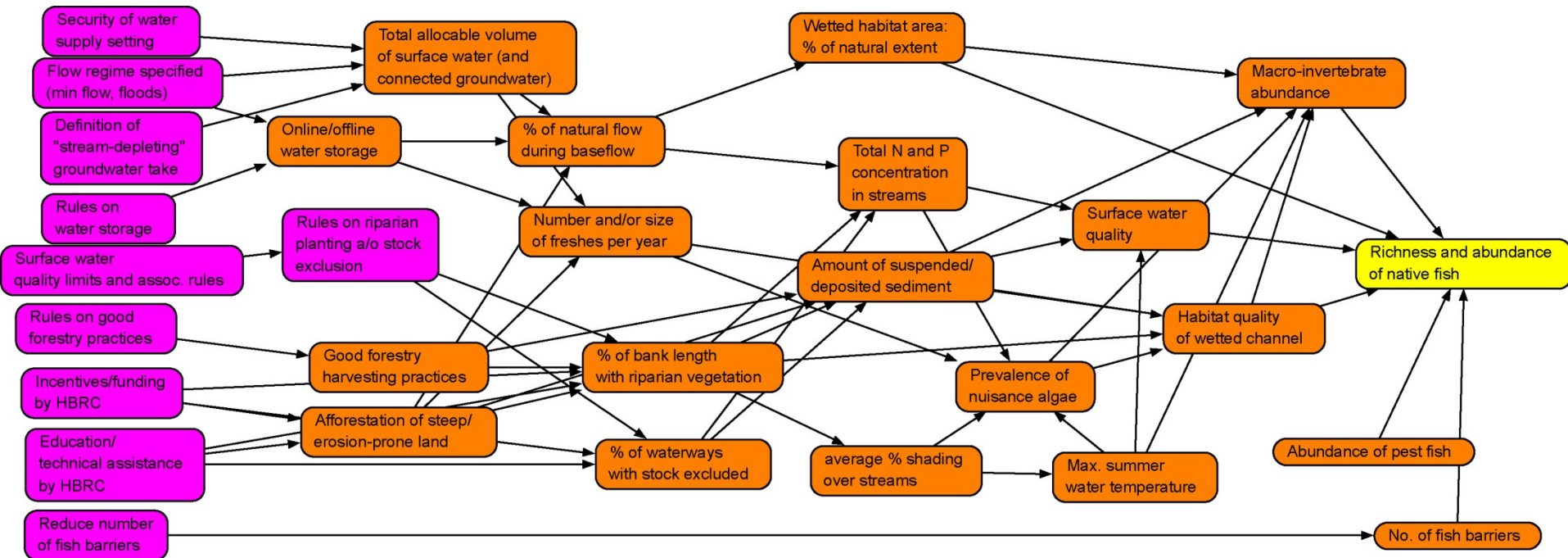
<b>Performance Measures</b>	<b><i>Option A:</i> Raise min flow Nutrient cap</b>	<b><i>Option B:</i> Current min flow Stock exclusion</b>	<b><i>Option C:</i> Current min flow Stock exclusion</b>
New full-time jobs in horticulture & farming	Loss of x jobs (how many?)	No change in jobs	Gain of x jobs (how many?)
Trout habitat as % of maximum	90% of trout habitat	70% of trout habitat	50% of trout habitat
Cultural health index	Good	Fair	Fair – Poor



# Influence diagrams



# BN for native fish



See also BN for full system:

H:\Common\FRST FW Programmes\Values, Monitoring & Outcomes\Hawkes Bay case study\BBN



Values	Objectives	Performance Measures
<ul style="list-style-type: none"> <li>Life-Supporting Capacity</li> <li>Mauri and Taonga</li> <li>Habitat /Indigenous biodiversity</li> </ul>	Safeguard the life-supporting capacity and enhance the mauri of waterways	<ul style="list-style-type: none"> <li>Macroinvertebrate assemblage including community index score</li> <li>Mauri</li> <li>Richness and abundance of native fish</li> <li>Area of wetlands</li> <li>Condition of wetlands</li> <li>Mahinga kai quality and availability</li> <li>Richness and abundance of native birds</li> </ul>
<ul style="list-style-type: none"> <li>Food gathering</li> <li>Household and urban water supply (for drinking and other uses)</li> <li>Human health and wellbeing</li> </ul>	Improve the health of Hawke's Bay communities	<ul style="list-style-type: none"> <li>Reported cases of water-borne disease/year</li> <li>Potable water quality in groundwater</li> <li>Potable water quantity (days of restrictions/year)</li> <li>Potable water quantity (Number of people with vulnerable supplies)</li> </ul>
<ul style="list-style-type: none"> <li>Food and fibre production and processing</li> <li>Amenity &amp; tourism</li> <li>Household and urban water supply (for drinking and other uses)</li> </ul>	Improve the Hawke's Bay economy	<ul style="list-style-type: none"> <li>Number of jobs in water-dependent sectors</li> <li>Total profit in water-dependent sectors</li> <li>Certainty of water supply for water-dependent sectors (Number of years with <math>\leq 5</math> days full water restrictions)</li> <li>Net benefit of policy measures</li> </ul>
<ul style="list-style-type: none"> <li>Food gathering</li> <li>Swimming and wading (Primary Contact recreation)</li> <li>Kayaking and boating (Secondary Contact recreation)</li> <li>Trout fishing</li> <li>Amenity &amp; tourism</li> </ul>	Improve recreational freshwater opportunities	<ul style="list-style-type: none"> <li>Aggregate number of days per year sites are suitable for swimming</li> <li>Water flows for whitewater boating</li> <li>Water flows for flat-water boating</li> <li>Aesthetics of waters</li> <li>Angler days</li> <li>Income from freshwater related tourism</li> </ul>
<ul style="list-style-type: none"> <li>Kaitiakitanga</li> <li>Mana</li> <li>Mauri and Taonga</li> </ul>	Recognise and provide for tangata whenua values and interests in freshwater and improve opportunities for Māori to access and use freshwater resources	<ul style="list-style-type: none"> <li>Tāngata whenua involvement in governance</li> <li>Use of Mātauranga Māori in environmental monitoring and reporting</li> <li>Māori water allocations</li> </ul>
<ul style="list-style-type: none"> <li>Whakapapa and Wāhi tapu</li> </ul>	Increase identification, recognition and protection of wāhi tapu and wāhi taonga.	<ul style="list-style-type: none"> <li>Wāhi tapu register</li> <li>Tāngata whenua involvement in governance</li> </ul>

---

# TANK Group Report 1

## Interim Agreements

---



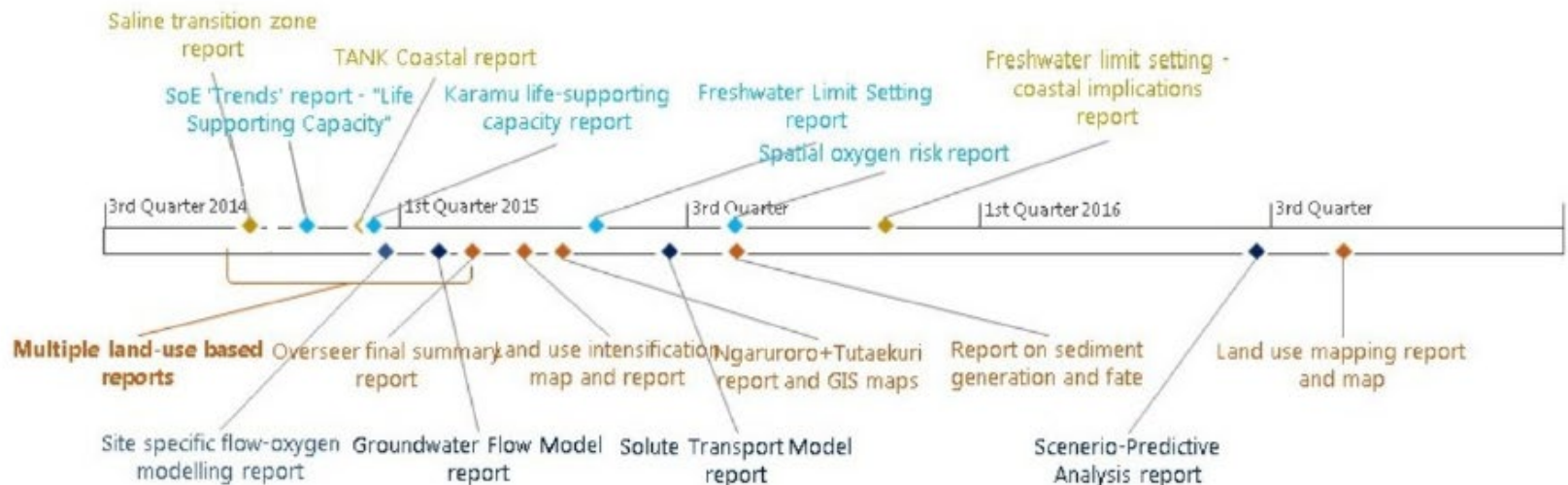
*Naku te rourou nau te rourou ka ora ai te iwi*  
*With your basket and my basket the people will live*

Report No. SD 14/01  
HBRC Plan No.4594

  
**HAWKE'S BAY**  
REGIONAL COUNCIL

# Model and science development

- Technical Advisory Group (or TAG)
  - Support the TANK policy development to test and confirm any proposals for work
  - Transparent and relevant science
- Established by invitation
- Cross-section of the various interests at the TANK table
  - Include New Zealand's best scientists.





# NPSFM - NOF Process

1. What are we managing our water bodies for?  
(our values and our objectives)

2. What attributes are important for our values/objectives?

3. What state do the attributes need to be?

4. What is the current state of these attributes?

5. How do our desired and current states compare?

6. What are the threats and risks to attributes/objectives?

7. How can we manage the attributes and threats/risks?

8. Can we afford it, will this be effective?

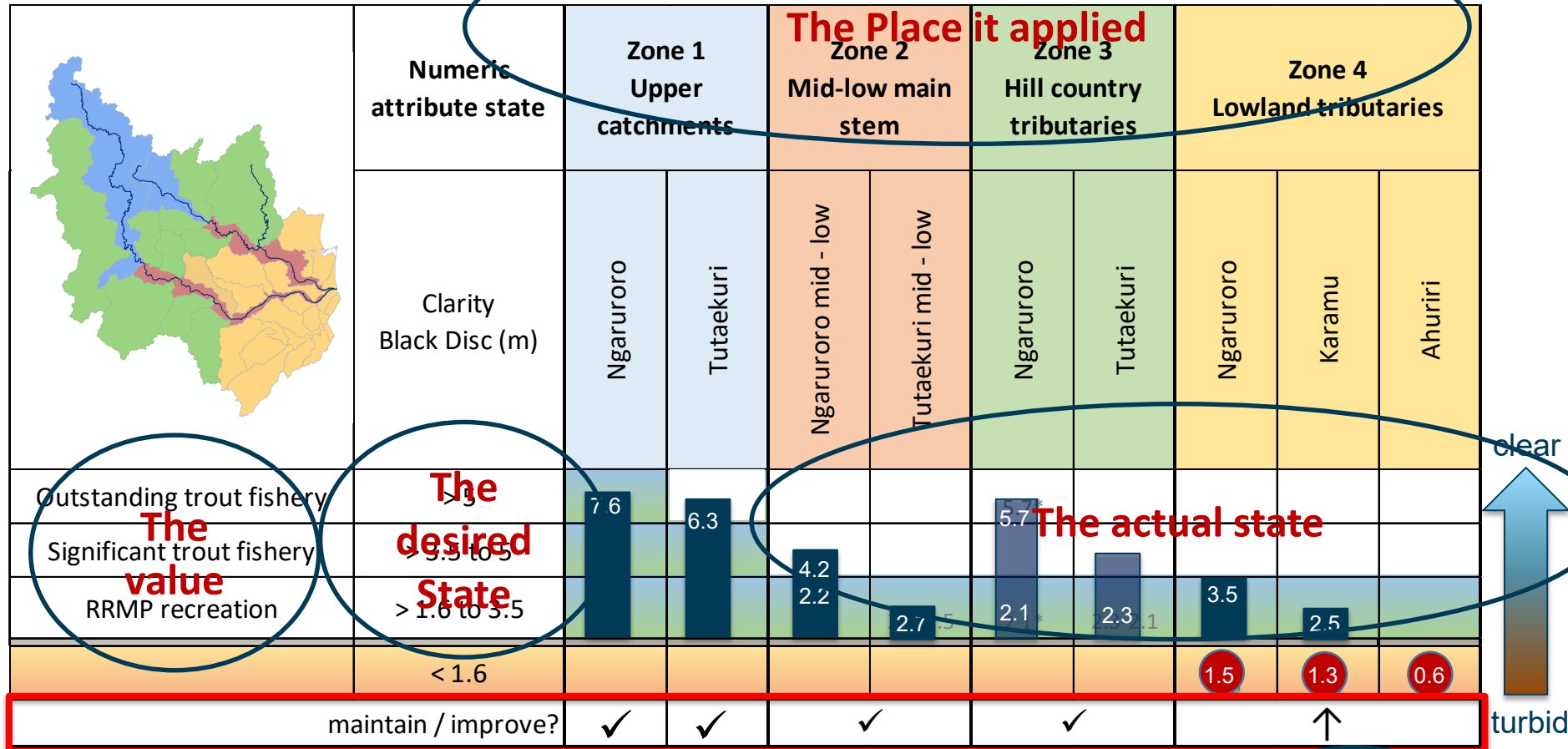
# Attributes, Values and Water Quality Objectives

- Values
- Attributes
- Attribute State
  - Desired versus actual
  - Critical value
    - NOF, Guidelines, standards, research papers



# Attributes: State and Objective

Clarity: trout fishery, recreation



- Below guidelines
- ✓ Maintain
- ↑ Improve
- Applicable guideline for defined value
- Applicable guideline not met
- Value not identified for management unit



- **Management responses**

- **Priority catchments** – modelled and actual data
- **Site specific** - farm plans are critical
- **Targeted management** – key mitigations e.g.
  - Riparian land
  - Stock exclusion
  - Erosion control
  - Wetlands
- **Targeted rules** – based on GAP

- **Impacts**

- Benefits identified
  - but not all quantified
- Costs - How much would the mitigations cost?



# Assessment of Costs

- Concept

1. Build a series of base models that represent agricultural and horticultural systems in the TANK catchment
2. Run various mitigation and water allocation scenarios across the base models to determine the impact variance
3. Scale the base models and scenarios impacts in order to represent the entire catchment impacts in economic and social returns.



## **Irrigated Land**

### **Sediment loss mitigations**

- setbacks
- gap (Hort NZ)

### **Nutrient mitigations** (SPASMO)

### **Riparian land**

- Shading
- Planting

## **Pastoral Hill Country**

### **Riparian land**

Stock exclusion

Planting & fencing

### **Nutrient mitigations**

### **Erosion control**

30% reduction in  
sediment loss (Sednet)





# Sediment Mitigation

Sediment			
	Model Farm - Specific Crop risk assessment, mitigation options and other management factors carried out	Model Farm - Assessment + Mitigation \$	Total \$ - Assessment + Mitigation
Pipfruit	Site specific sediment risk assessment carried out. Pipfruit are a permanent crop - Minimal sediment loss expected	\$ 200	\$ 30,030
	Site specific sediment risk assessment carried out. Grapes are a permanent crop with minimal stream edge exposure- Minimal sediment loss expected	\$ 50	\$ 12,075
Grapes	Site specific sediment risk assessment carried out. Summerfruits are a permanent crop - Minimal sediment loss expected	\$ 100	\$ 2,778
Summerfruit	Site specific sediment risk assessment carried out. Kiwifruit is a permanent crop - Minimal sediment loss expected	\$ 50	\$ 1,636
Kiwifruit	Site specific sediment loss risk carried out. Vege crops generally moderate / high sediment loss risk. Use best practice guidelines. Develop management strategy, potential solutions, sediment traps, grass filter strips etc. Ongoing sediment loss monitoring program	\$ 27,000	\$ 717,164
Combined Vegetable			\$ 763,684

# Sediment Mitigation

	Model Farm - Specific Crop risk assessment and mitigation options and factors carried out	Model Farm - Assessment + Mitigation \$	Total \$ - Assessment + Mitigation
Pipfruit	Site specific assessment of sediment risk. Pipfruit is a permanent crop - Minimal sediment loss expected. Sediment risk assessment carried out. Minimal sediment loss risk carried out.	\$ 30,030	\$ 30,030
Grape	Site specific assessment of sediment risk. Grape is a permanent crop - Minimal sediment loss expected. Sediment risk assessment carried out. Minimal sediment loss risk carried out.	\$ 50	\$ 12,075
Sun-fruit	Site specific assessment of sediment risk. Sun-fruit is a permanent crop - Minimal sediment loss expected. Sediment risk assessment carried out. Minimal sediment loss risk carried out.	\$ 100	\$ 2,778
Kiwi	Site specific assessment of sediment risk. Kiwi is a permanent crop - Minimal sediment loss expected. Sediment risk assessment carried out. Minimal sediment loss risk carried out.	\$ 50	\$ 1,636
Combined Vegetable	Site specific assessment of sediment risk. Vegetable is a permanent crop - Minimal sediment loss expected. Sediment risk assessment carried out. Minimal sediment loss risk carried out. Vege crops generate / high sediment loss risk. Use best guidelines. Develop management strategy, potential solutions, sediment traps, grass filter strips etc. Ongoing sediment loss monitoring program	\$ 27,000	\$ 717,164
			\$ 763,684

Nutrient management - GAP

Riparian land – cultivation setbacks

Riparian land – Planting

# Stock Proof Fencing in TANK Catchment



TANK Catchment		Fencing categories	
Zone	Fence length (kms)	Through Zone	Through Zone
Sum			
	165		2%
	15		13%
Fair		65	50%
Poor		28	6%
		100%	
Summer Dry			
Excell	52	15	
	109		
	100		
			100%
Intensive			
Excellent		95	34%
Good		75	27%
Fair		62	22%
		49	18%
	399	100%	282 100%
	1198 kms		568 kms



Nutrient management GAP

Riparian land – Planting

Erosion Controls (various) (30% reduction in sediment loss)



- The costs analysis influenced
  - Timeframes
  - Methods
    - Incentives.....Resources ....
- The costs assessment didn't change water quality objectives



Farm scale mitigation costs  
scaled up in a regional  
impacts assessment

# Water Quantity

- Better information
  - Models
  - Connectivity
- Predictive tools
  - Management options

# Overview of modelling

AQUALINC

NIWA  
Taihoro Nukurangi



Williamson  
Water Advisory

HBRC Data  
NeSI Supercomputer  
Irrigation Demand and Recharge model

MODFLOW  
GW flow



NeSI  
New Zealand eScience  
Infrastructure



Integrated  
GW-SW  
model

HBRC Data  
OVERSEER  
Climate Data

SOURCE SW  
flow and  
nutrients

HBRC Data  
OVERSEER  
MODFLOW

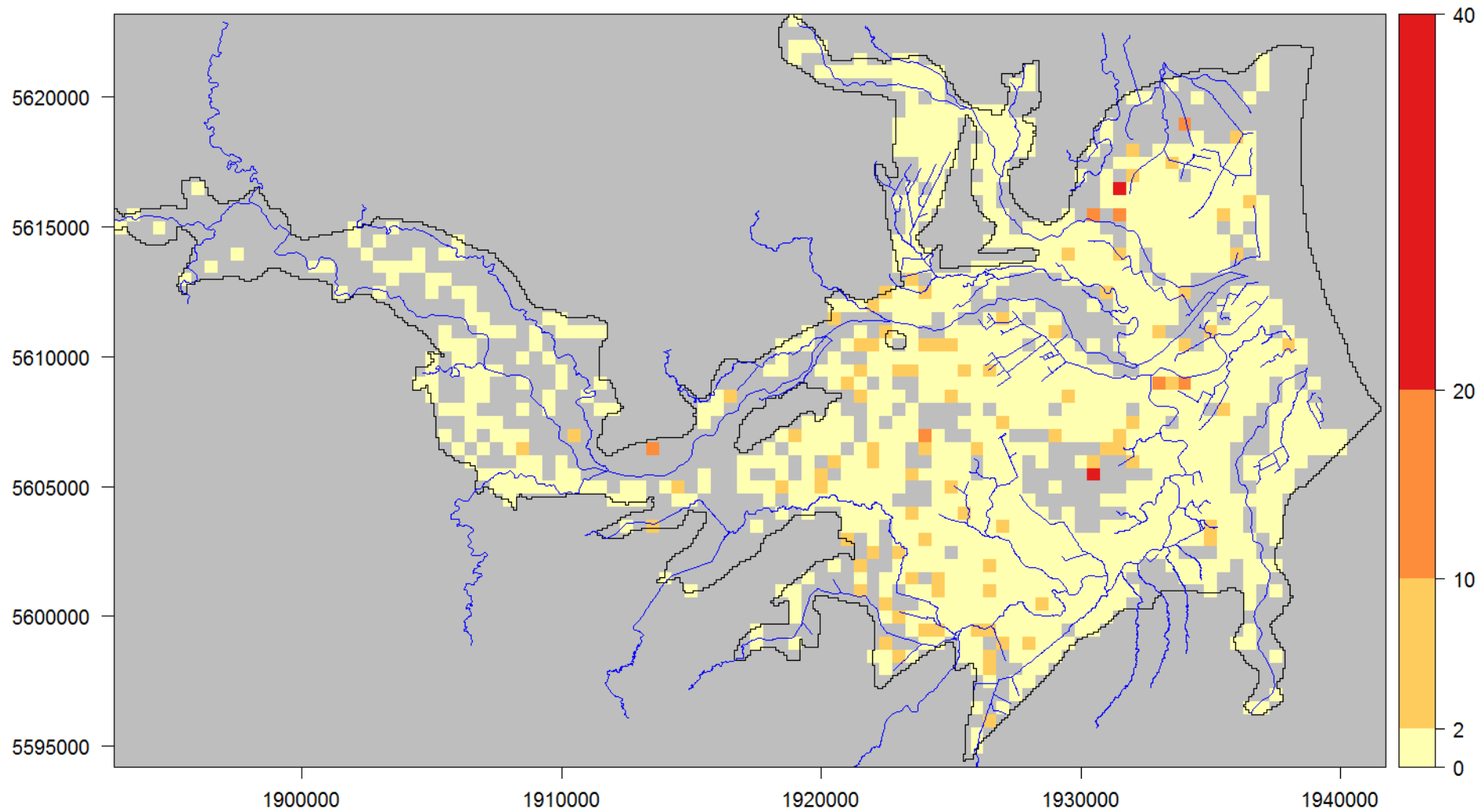
MT3DMS  
GW  
nutrients

HAWKE'S BAY  
REGIONAL COUNCIL

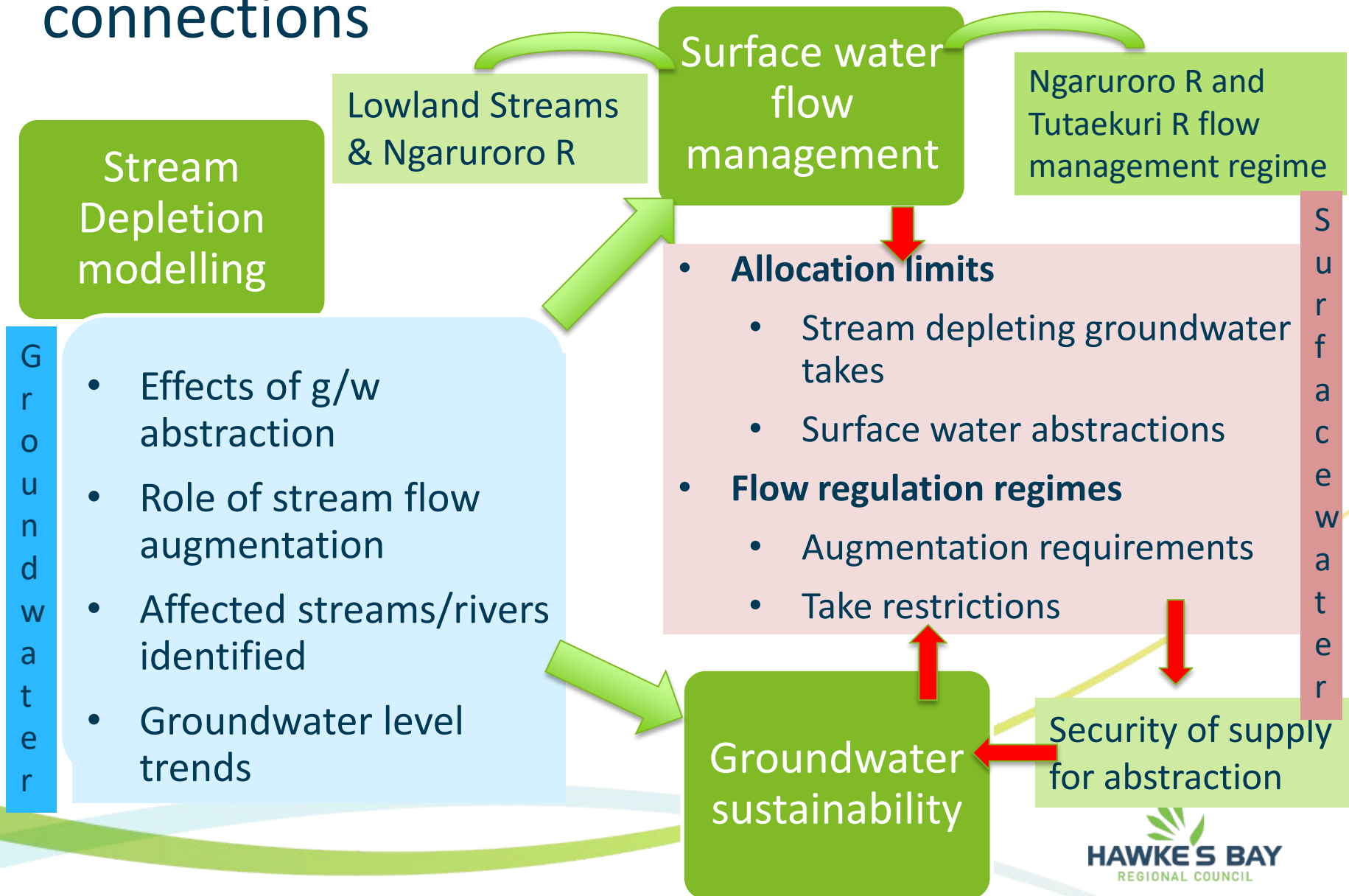
HAWKE'S BAY  
REGIONAL COUNCIL



**Actual pumping effect L/s after 150 days on Ngaruroro**



# Decision Making Context – understanding connections

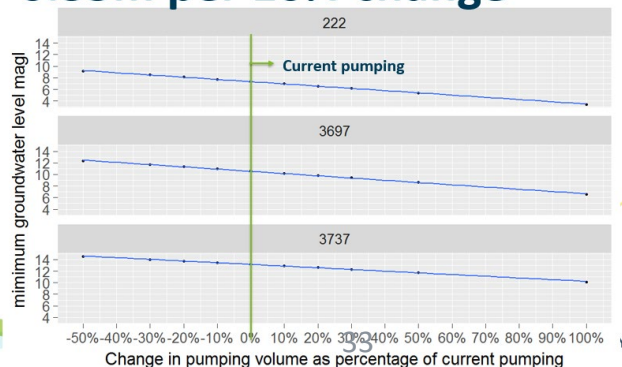


# Options and Impacts – Groundwater

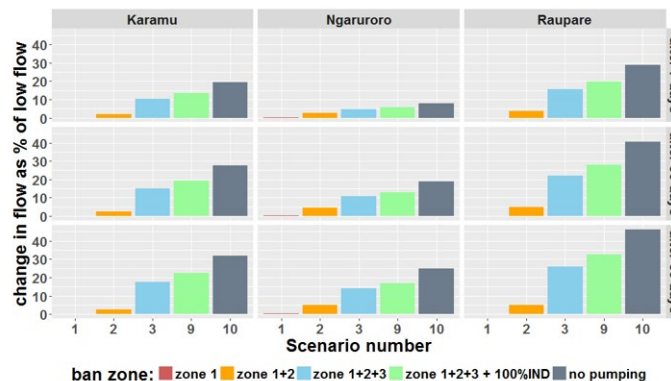
- Groundwater surface water connections;
  - Understanding stream depletion
    - Effects on flows and oxygen levels
  - Testing different management options
    - Water take restrictions @ different flows
    - Pumping bans
    - Reductions in allocations
    - Flow mitigations
    - Augmentation

Sensitivity of groundwater level to pumping - summary

**0.35m per 10% change**



Ban scenario results :

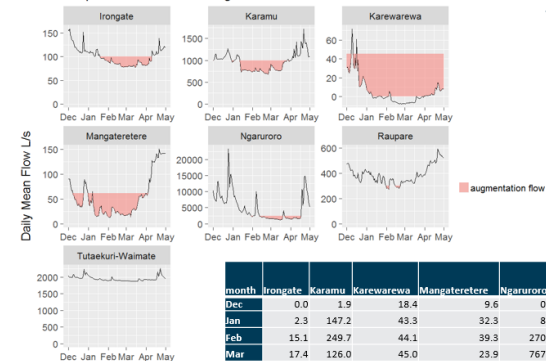


Flow estimates to achieve oxygen levels

Site	60% oxygen	40% oxygen	0.04 m/s	Confidence	MALF L/s (existing)	Existing Min. flow L/s
Irongate	1300	370	92	low	170	160
Riverslea Rd						
Louisa	340	77	22	moderate	36	30
Te Aute Rd						
Tutaekuri-Waimate	1800	540	140	moderate	1860	1200
Goods						
Raupare	510	240	100	high	402	300
Ormond Rd						
Mangateretere	350	60	17	moderate	48	100
Napier Rd						
Awanui flume	800	270	110	high	90	120
Karewarewa	640	170	45	moderate	25	75
Pakipaki						
Karamu floodgates	4900	1600	380	low	970	1100

2012-2013 Data-based Augmentation Flows  
recommended augmentation flows

Required Stream Flow Augmentation for 2012-2013 conditions



Total annual augmentation:  
**2.4 Mm<sup>3</sup>/yr**  
(3% of total current pumping  
76 Mm<sup>3</sup>/yr)

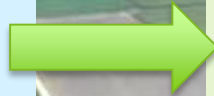
month	Irongate	Karamu	Karewarewa	Mangateretere	Ngaruroro	Raupare	Tutaekuri-Waimate
Dec	0.0	1.9	18.4	9.6	0.0	0.0	0.0
Jan	2.3	147.2	43.3	32.3	8.3	0.0	0.0
Feb	15.1	249.7	44.1	39.3	270.6	6.1	0.0
Mar	17.4	126.0	45.0	23.9	767.7	0.0	0.0
Apr	3.8	0.0	40.0	0.2	361.9	0.0	0.0
May	0.0	0.0	37.0	0.0	0.0	0.0	0.0



# Impacts of Changes to River Flows

Groundwater depletion effects

Direct abstraction effects



Impact on river flows;

days at or below a specified flow  
levels of habitat protection  
mean annual low flows  
oxygen levels in lowland streams



# Impacts of Changes to River Flows

Groundwater depletion effects  
Direct abstraction

Impact on river flows;  
days at or below a specified flow  
levels of habitat protection  
mean annual low flows  
oxygen levels

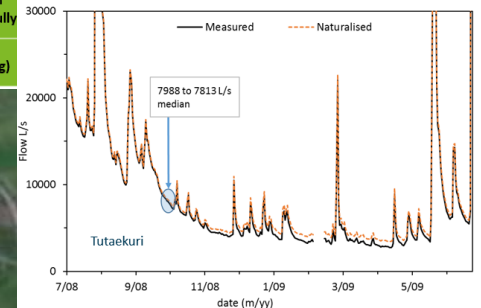
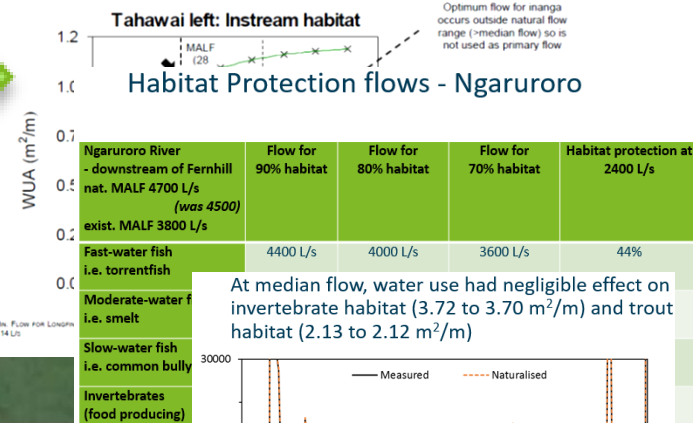
## Management Options Developed

SW Modelling Scenario Development:  
Ngaruroro & Tutaekuri

Scenario	Example A	Example B	Example C
Catchment	Ngaruroro & Tutaekuri	Ngaruroro & Tutaekuri	Ngaruroro
Management Sites	Current Minimum Flow Sites	Current Minimum Flow Sites	Current Minimum Flow Sites
Allocation Regime + Limit	Current Core & High Flow Allocation	Current Core & High Flow Allocation	Current Core & High Flow Allocation
Restriction Regime	Minimum Flows (Full Restriction)	Minimum Flows (Full Restriction)	Minimum Flows + Staged Reductions
Restriction Regime Detail	Current Minimum Flows	New/Revised Minimum Flows - Target Species = Fast-Water - Level of Habitat Protection = 90% of habitat at MALF	New/Revised Minimum Flows - Target Species = Fast-Water - Level of Habitat Protection = 70% of habitat at MALF 3-Stage Reduction - Stage 1 = MALF - Stage 2 = 90% of habitat at MALF - Stage 3 = 80% of habitat at MALF

7 scenarios modelled

Minimum flow from RHYHABSIM  
uses MALF (mean annual low flow)





# Impacts of Changes to River Flows

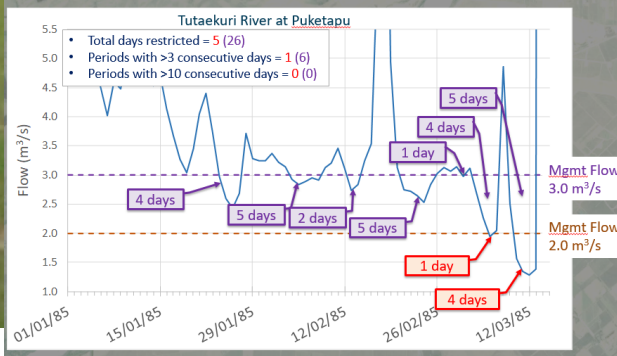
Groundwater depletion effects  
Direct abstraction

Impact on river flows;  
days at or below a specified flow  
levels of habitat protection  
mean annual low flows  
oxygen levels

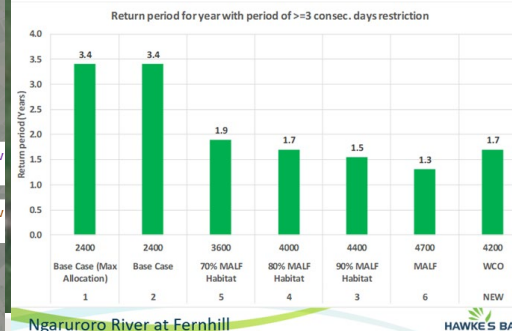
Minimum flow and allocation limit  
options

Security of Supply data

## How is Reliability of Supply measured?



3 or more days of consecutive restriction likely to occur  
more often with higher minimum flows



# Impacts of Changes to River Flows

Groundwater depletion effects  
Direct abstraction

Impact on river flows;  
days at or below a specified flow  
levels of habitat protection  
mean annual low flows

Minimum flow and allocation limit  
options

Security of supply

Impact on Production

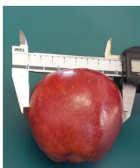
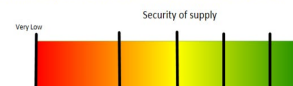
Farm scale impacts  
(EBIT) → flow on  
impacts at regional  
scale

## Irrigation management scenarios

- The current situation, and two alternative options will be reported on
- How we model the current and alternative situations is in discussion.
- The current concept is to model a range of situations along the continuum of security of supply (high to low).
- We are looking at data from the 14 current low flow points to find their place on this continuum.
- Stepwise options will be modelled.

## Size and Quality


- SPASMO will give us change in dry matter due to water deficits occurring in each scenario.
- We are now working on how size and quality is affected by levels of water deficit for each modelled crop.








# Horticulture Scenarios

- Scenario 1 Base
    - 79% No ban, 21% Nga2400
  - Scenario 2 Future B
    - 74% GW2013, 20% Nga3600, 6% Tut2500
    - Mitigation expenditures
  - Scenario 3 Future C
    - 74% GW 9/10, 20% Nga3600, 6% Tut2500
    - Mitigation expenditures
- 



## Pastoral Scenarios

- Scenario 1 Base
    - Current practice
  - Scenario 2 MS1
    - Sediment mitigation (30% reduction, over 10 yrs)
    - Land to forestry (retired and production)
  - Scenario 3 MS2
    - Sediment plus nutrient reduction (10%, 10 yrs)
    - Land to forestry (retired and production)
- 

## Scenarios

*Horticulture*  
Base

Future B

Future C

*Pastoral (incl.  
Forestry)*

Base

MS1

MS2

*Combined  
Horticulture &  
Pastoral (incl.  
Forestry)*

Future B + MS1

Future C + MS2

### TANK Wider Economic Impacts Modelling

#### Hawke's Bay

##### Farm Systems

Available  
Systems of  
Production  
(incl.  
mitigations)

Mode of  
production/  
consumption

Land use

Consumers

Other  
Industries

Factors  
(labour, built &  
natural capital)

#### Rest of NZ

Consumers

Industries

Factors  
(labour, built &  
natural capital)



# What happens to communities and cultures?

## Social and cultural assessment

### TANK catchments





# Key Information Sources

- Community Reference Group – how TANK water management impacts on them and their values
  - Extensive interviews and workshops
- Population and demographics
- Changes to indigenous vegetation/wetlands
- Income structure and benefit dependency
- Adverse social determinants of health including employment, crime and poverty statistics
- Role of primary production regional economy

# Key Findings

- Population
  - Short residency times - cultural memory
  - Aging and increasingly urban
  - Mana whenua living elsewhere – need jobs/homes/social services  
Diminishing cultural survival
- High benefit dependency and low incomes
  - High level of vulnerability to some communities to changes to regional economy
  - Māori communities especially vulnerable
- The mana/mauri of whānau Māori in Hawke's Bay is seriously diminished, in some cases to the brink of extinction
- High representation of Māori in adverse social determinants of health including employment, crime and poverty statistics
- Primary production significant for regional economy

# Next steps

- Regional Planning Committee filling in the gaps
  - Items of non-consensus
  - Drinking water management
- Version 8
- Consultation on the draft plan change
  - Further feedback
- Pre-notification and notification stages
  - Public submissions
  - Etc

# Thank You

